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Council for Quality Assurance in
General and Further Education and Training

Predictability of the National Senior Certificate Examinations
Mathematics Report
DBE & IEB

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ACRONYMS/ABBREVIATIONS

CAPS	Curriculum and Assessment Policy Statement
DBE	Department of Basic Education
IEB	Independent Examinations Board
MCQ	Multiple Choice Question
NSC	National Senior Certificate
SACAI	South African Comprehensive Assessment Institute
SAGs	Subject Assessment Guidelines

Section 1: Overview of the Subject

The Curriculum and Assessment Policy Statement (CAPS) define Mathematics as a universal language that uses symbols, notations, and representations to describe numerical, geometric, and graphical relationships. As a human intellectual activity, Mathematics involves observing, representing, and investigating patterns and relationships in both the physical and social phenomena, as well as within mathematical objects. Through these processes, it develops essential mental abilities such as logical reasoning, critical thinking, precision, and systematic problem-solving, enabling learners to interpret complex phenomena and make informed decisions.

Mathematics education aims to develop both conceptual understanding and procedural fluency. Learners are expected to perform accurate computations without undue reliance on calculators, apply mathematical concepts to authentic contexts through modelling, and solve problems related to health, economics, science, politics, culture, and the environment. The curriculum also promotes investigative thinking by encouraging learners to identify patterns, make generalisations, formulate conjectures, and justify their reasoning. In addition, learners develop an appreciation of Mathematics as a discipline shaped by historical and cultural developments.

The CAPS further emphasises inclusive and meaningful learning experiences that accommodate diverse learner needs. Mathematics teaching should therefore focus not only on how to solve problems but also on when and why particular mathematical methods are appropriate. Strong conceptual understanding enables learners to apply mathematical knowledge effectively in unfamiliar contexts and prepares them for further study, training, and the world of work.

To develop mathematical competence, learners are expected to use mathematical language accurately; collect, analyse, and interpret quantitative information; apply mathematical processes to investigate and solve problems; demonstrate spatial reasoning; and communicate mathematical ideas effectively using words, symbols, graphs, tables, and diagrams. Together, these competencies support informed participation in society and lifelong learning.

This report presents the findings of the evaluation of the predictability of the Department of Basic Education (DBE) and the Independent Examinations Board (IEB) National Senior Certificate (NSC) Mathematics examination papers administered between 2022 and 2024. The findings are presented by examinable topic in accordance with the CAPS and the IEB Subject Assessment Guidelines (SAGs). The report also provides topic-specific recommendations for the DBE and the IEB, respectively.

Section 2: Research Design

The study employed a qualitative research design using document analysis to examine the predictability of DBE and IEB examination papers administered between 2022 and 2024. Document analysis was considered appropriate because the study relied on existing examination papers and marking memoranda, thereby enabling the subject expert to systematically interpret and evaluate these documents.

Purposive sampling was used to select ten high-enrolment subjects offered by the DBE and the IEB. The South African Comprehensive Assessment Institute (SACAI) was excluded from the study because its examination guidelines closely align with those of the DBE. Mathematics was selected as one of the high-enrolment subjects.

Data were collected by a single subject expert who analysed all relevant examination papers over the three-year period using evaluation instruments grounded in the principles of content and construct validity. The conceptual framework underpinning this study is discussed in detail in the *NSC Predictability Overview Report*. The subject expert examined each examination item, compared trends across the three years, and assessed the alignment of the examination with the CAPS and Abridged CAPS topics. A structured Microsoft Word-based instrument, comprising tables and thematic questions, guided the analysis of topic coverage, question types, cognitive skills assessed, and mark allocation. This approach enabled a comprehensive evaluation of the predictability of the examination papers. The thematic questions used in the evaluation are discussed in detail in the *NSC Predictability Overview Report*.

Section 3: Findings from the Evaluation of the DBE and IEB Question Papers

This chapter presents the findings of the evaluation of the DBE and IEB National Senior Certificate (NSC) Mathematics Paper 1 and Paper 2. The findings are based on a systematic analysis of examination papers administered between 2022 and 2024 and provide an overview of patterns relating to examination predictability.

The primary purpose of this study was to investigate whether the upward trend in learner performance in NSC examinations reflects genuine improvements in learner competence or whether it may, in part, be attributed to increasing levels of predictability in examination design. By analysing selected subjects over three consecutive examination cycles, the study sought to generate evidence-based insights to strengthen Umalusi's quality assurance and standardisation processes. In doing so, the study contributes to broader scholarly discourse on the validity, fairness, and integrity of high-stakes examination systems.

The findings are presented separately for the DBE and the IEB in Sections IIIA and IIIB, respectively, and for each discourse paper. The analysis is organised according to the thematic questions in the evaluation instrument, which are discussed in detail in the research design section of the *NSC Predictability Overview Report*.

For each examinable topic, the findings are summarised in tabular format and accompanied by a discussion based on six themes: topic coverage, content coverage by subtopic, topic weighting, item types by subtopic, subtopic–skill pairing, and scenario–subtopic–skill pairing. The analysis of these themes is presented in Sections a to f for each table. It evaluates the extent to which the components reflected in each table may have contributed to the predictability of the topics assessed in the Mathematics Paper 1 and Paper 2 examinations between 2022 and 2024.

Before presenting the findings, the six analytical themes are defined in Sections a to f below. These definitions apply to the analysis of both Paper 1 and Paper 2 across the two assessment bodies.

a. Topic coverage

The topics prescribed for examination of the NSC subjects are outlined in Section 4 of the CAPS or the Abridged CAPS. These guidelines help ensure alignment between the examination and the intended curriculum. The analysis of topic coverage focused on the frequency with which each topic was examined over the three years, specifically identifying any emerging patterns that may have contributed to the predictability of topic selection.

b. Content coverage

This section examined the extent to which specific content areas or subtopics within the selected topic have been assessed over the three-year period. By analysing the frequency and repetition of subtopics in the Mathematics final examination question papers, the aim was to determine whether any patterns of content selection have emerged that may contribute to the predictability of the question paper.

c. Weighting of the topic

This section explored the distribution of mark allocation or weighting assigned to the selected topic over the three-year period. By analysing whether the marks allocated to this topic have remained consistent, increased, or decreased across examination cycles, the aim was to determine the extent to which predictable emphasis may have emerged.

d. Variation in item types

To evaluate the extent to which question design contributed to the predictability of examination papers, it was essential to examine how specific item types have been used to assess a given topic over time. This included analysing the variety of item types employed (such as multiple-choice questions [MCQs], essays, calculations, and practical scenarios), the distribution of marks allocated to each type, and how difficulty levels and cognitive demands have varied. Additionally, the use of command words, terms that guide the expected cognitive response, can influence question predictability. This section examined these dimensions over the three-year period to identify patterns that may signal repetition or predictability.

e. Topic and skill pairing

To evaluate the predictability of examination question papers, it was crucial to examine how specific cognitive skills have been paired with particular topics over time. Consistent assessment of the same skills, such as interpretation, calculation, analysis, or explanation, when linked to a specific topic across multiple years, may signal a recurring pattern, potentially leading to predictability. Conversely, variation in skill pairing can help ensure a more comprehensive assessment of the intended learning outcomes. This section explored the extent to which skill demands associated with this topic have remained consistent or varied across the past three years and determined whether such patterns suggest predictability in assessment design.

f. Scenario framing of items for a topic

Some examination questions use scenarios, visual stimuli, or real-life contexts to test skills within a given topic. The variety or repetition of such contexts over multiple years can influence the anticipation of the nature of questions. Consistent use of similar scenarios may contribute to predictability, whereas diverse and novel contexts encourage more profound understanding and critical thinking. This section explored how the contextual framing of questions for each topic has evolved over the past three years and sought to determine whether predictability patterns existed.

3.1: MATHEMATICS PAPER 1

This section presents an analysis of the final examination question papers from 2022 to 2024 for Mathematics Paper 1 topics. The findings for each topic are summarised in Tables 3.1.1–3.1.12.

Table 3.1.1 below summarises the analysis conducted to determine the level of predictability for the Algebra topic for DBE Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.1.1: Findings on the Predictability of the Algebra Topic for the DBE Mathematics Paper 1 Examinations from 2022–2024

Topic: Algebra									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	1.1.1	Quadratic equations – solving from factorised form	2	25	Procedural Task	1	1	Solving equations
		1.1.2	Quadratic equations – solve using quadratic formula	3		Procedural Task	1	2	Solving equations
		1.1.3	Quadratic inequalities in one variable	4		Procedural Task	1	2	Solving inequalities
		1.1.4	Equations involving surds	4		Procedural Task	2	2	Solving surds

		1.2	Simultaneous equations – solve non-linear system in x and y	5		Procedural Task	1	2	Solving simultaneous equations
		1.3	Exponent laws – evaluation	3		Procedural Task	2	2	Evaluation exponents
		1.4	Exponential equations – unknowns in exponent	4		Procedural Task	2	2	Solving exponents and surds
2023	✓	1.1.1	Quadratic equations – solving from factorised form	3	24	Procedural Task	1	1	Solving equations
		1.1.2	Quadratic equations – solve using quadratic formula	4		Procedural Task	1	2	Solving equations
		1.1.3	Equations involving surds	4		Procedural Task	1	2	Solving surds
		1.1.4	Quadratic inequalities in one variable	4		Procedural Task	2	2	Solving inequalities
		1.2	Simultaneous equations – solve non-linear system in x and y	5		Procedural Task	2	2	Solving simultaneous equations
		1.3	Exponential equations – unknowns in exponent	4		Procedural Task	3	3	Solving exponents
2024	✓	1.1.1	Quadratic equations – solving from factorised form	2	27	Procedural Task	1	1	Solving equations

		1.1.2	Quadratic equations – solve using quadratic formula	4		Procedural Task	1	2	Solving equations
		1.1.3	Quadratic inequalities in one variable	4		Procedural Task	2	2	Solving inequalities
		1.1.4	Exponential equations – unknowns in exponent	5		Procedural Task	1	2	Solving equations
		1.1.5	Equations involving surds	4		Procedural Task	2	2	Solving surds
		1.2	Simultaneous equations – solve non-linear system in x and y	5		Procedural Task	1	2	Solving simultaneous equations
		1.3	Real number systems	3		Procedural Task	4	4	Understanding real number systems

Table 3.1.1 presents a comparative overview of the Algebra topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.1.1 have contributed to the predictability of the DBE Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that Algebra appears consistently across all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a

predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised into specific questions (e.g., Algebra is in Question 1) of the examination question papers, as was the case during the period under review. The subtopics that constitute Algebra are arranged in the same manner each year; this arrangement is not strictly a requirement of CAPS. The format affects the difficulty and cognitive demand of the subtopics. The items in a question are arranged from the easy to the challenging levels. The overall arrangement affects the subtopics' weighting, item types, topic–skill pairing, and item framing; these will be discussed in the subsequent sections.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year; the consistent presence and arrangement of the subtopics in the examination question papers suggest predictability, which is not necessarily unacceptable.

c. Weighting of the topic

The CAPS and Mathematics Assessment Policy Statement prescribe that 25 marks of the total marks of the examination question papers should be allocated to Algebra, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Algebra has remained largely consistent across the three years, with each paper assigning 25 ±3 marks. This consistency reflects an acceptable level of predictability and is aligned with the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Algebra subtopics; the same item types are used over the years. In all three years, the Algebra items are procedural. Moreover, the levels of difficulty, cognitive levels, and the mark allocation for the items remain

consistent, resulting in the examination question papers having the same format, structure, and tone each year. These patterns result in fairly predictable examination question papers, although calming for the candidates. According to the CAPS, contextual questions should be applied to any topic, and the integration of topics is supported. The lack of variation in the item types results in anticipated examination items, which may be reversed by including contextual (modelling) questions in Algebra and integrating subtopics. Topics and subtopics should not be treated in isolation within examination questions; rather, their integration must constitute a fundamental component of every examination question paper.

e. Topic and skill pairing

The analysis indicates that under Algebra the topic–skill combinations remain relatively similar over the three-year period. The items are in the same form and style; this means the same skills and approaches are assessed. The underlying structure of the items remains relatively similar, allowing the candidates to demonstrate procedural fluency on items of equivalent difficulty. The change in the item types used in Algebra will alter topic–skill combinations and make the paper less predictable. The topic–skill combinations may be changed by moving from simply solving equations to explaining why a method works, finding errors in solutions, justifying solutions, comparing strategies, and using real-world problems (modelling). The yearly change in the item types will affect the levels of cognitive demand and the difficulty of items. These changes will necessitate shifting the topic from its current position (e.g., Question 1), which will affect the overall structure of the papers and make the question papers less predictable. However, the change may also affect the fairness and accessibility of the examination question papers; these papers are kept relatively similar and predictable to avoid bias and ensure that test items are clear to all candidates.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the examination question papers analysed indicate that the framing of Algebra items

across 2022–2024 reflects both consistency in structure and presentation and a focus mainly on procedural fluency. The framing is free of conceptual and application items (except in parts where such items are expected), thereby promoting strategic thinking and allowing candidates to solve problems. Only the last items in Question 1 are often framed differently and do not relate to the same subtopic each year. This practice renders the items in the examination question papers in a similar way and, consequently, predictable. This can be avoided by ensuring that the items are not framed the same way year on year. Items can be framed differently by moving from abstract concepts to applied contexts (e.g., varying item types) and by varying the difficulty and demand of similar subtopics each year.

Summary of findings and recommendations for the DBE Mathematics Algebra topic

Table 3.1.2 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.1.2: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Algebra Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Question 1 fully justified. However, the items are ordered in the same way every year, making this section predictable. This issue will be discussed in detail under 'item types.'
Recommendations to avoid unacceptable predictability on topic coverage
The DBE should consider the following to minimise predictability:

- Algebra should not be Question 1 every year (order the topics differently annually)
- Vary the difficulty and cognitive demand of subtopics every year; this can be done by:
    - Integrating topics/subtopics beyond the usual areas, which requires careful handling
    - Ensuring that the topic weighting is not affected

Identified unacceptable predictability on content coverage

There is no unacceptable predictability. CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and the adherence indicates predictability, which is mandatory but not unacceptable.

Recommendations to avoid predictable content coverage

DBE should continue to ensure that the examination question papers cover Algebra and its subtopics as required by CAPS. However, there should be a variation of item types every year to reduce predictability.

Strategies to maintain content coverage that do not lead to a predictable question paper

Decompartmentalise sections or questions by integrating topics into a single question.

Include a variety of items: not only in abstract form but also grounded in context and real-world problems (modelling).

Identified unacceptable predictability on topic weighting

The topic weighting is fixed at 25 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.

Strategies to maintain topic weighting that do not lead to a predictable question paper

DBE should vary subtopic mark distribution by:

- Decompartmentalising sections, integrating topics into a single question
- Including items that are based on context, real-world problems

- Varying the difficulty and cognitive demand on items

Identified unacceptable predictability on item types

In Algebra, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.

Recommendations to avoid unacceptable predictability on item types

Include items that require remembering mathematical facts and definitions. Design Algebra items that require candidates to explain, interpret, compare or justify solutions, not only calculations. Include items where topics are integrated.

Strategies to maintain the assessment of item types that do not lead to a predictable question paper

The DBE should vary item types by:

- Decompartmentalising sections, integrating topics into a single question
- Including items that are based on context, real-world problems
- Varying the difficulty and cognitive demand on items

Identified unacceptable predictability on topic–skill pairing

The analysis indicates strong repetition of fixed topic–skill combinations. The subtopics and matching skills in Algebra remain relatively similar from year-to-year. Items are kept in a conventional way, with little to no expected variation. Subtopics are in the same form and style, requiring the same set of skills and approach (for example, quadratic equations are always in Algebraic form, never in words or other forms).

Recommendations to avoid unacceptable predictability through topic–skill pairing

Limit the repetition of identical skill chains from year to year. Develop topic–skill matrices that encourage greater variety of skills throughout the examination question papers, rather than relying on the same small set of routine procedures. Intentionally introduce cross-topic items (e.g., Algebra with functions) to disrupt fixed pairings and promote integrated reasoning. Minimise

assessing the same skill several times (e.g., simultaneous equations in Algebra and functions, finding the point of intersection of two functions).
Strategies to maintain topic–skill pairing that does not lead to a predictable question paper
The DBE should vary topic–skill pairing by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability in the scenario framing of items
The patterns observed indicate that the framing of Algebra items across 2022–2024 reflects both consistency in structure and presentation and focus mainly on procedural fluency. The framing is free of conceptual and application items, items that promote strategic thinking and allow candidates to solve problems. Only the last item in 'Question 1' is often framed differently and does not relate to the same subtopic each year.
Recommendations to avoid unacceptable predictability in scenario framing of items
The DBE should ensure that items are not framed the same way year on year. Include items that involve the application of Algebra, require strategic thinking and allow candidates to solve problems.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Ensure the items are not framed the same way year on year, by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items

Table 3.1.3 below summarises the analysis conducted to determine the level of predictability for the Patterns and Sequences topic for DBE Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.1.3: Findings on the Predictability of the Patterns and Sequences Topic for the DBE Mathematics Paper 1 Examinations from 2022–2024

Topic: Patterns and Sequences									
Year	**Topic Examined**	**Content Area/Subtopic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	2.1.1	Geometric sequences	2	24	Procedural Task	1	1	Calculating geometric sequence
		2.1.2	Geometric series	4		Procedural Task	2	2	Calculating geometric sequence
		2.1.3	Geometric series	3		Procedural Task	2	2	Calculating geometric sequence
		2.2	Sigma notation	5		Procedural Task	2	2	Evaluating sigma notation
		3.1	Quadratic sequences	2		Procedural Task	1	2	Working on a quadratic pattern
		3.2	Quadratic Patterns	2		Procedural Task	1	1	Working on a quadratic pattern
		3.3.	Quadratic Patterns	3		Procedural Task	1	2	Working on a quadratic pattern

		3.4	Quadratic Patterns	3		Procedural Task	3	3	Working on a quadratic pattern & understanding the real number system
2023	✓	2.1.1	Arithmetic sequences	3	26	Procedural Task	1	1	Working on an arithmetic sequence
		2.1.2	Arithmetic series	2		Procedural Task	1	1	Calculating an arithmetic series
		2.1.3	Arithmetic series	3		Procedural Task	1	1	Working on an arithmetic sequence
		2.2.1	Quadratic Patterns	2		Procedural Task	2	2	Working on a quadratic pattern
		2.2.2	Quadratic Patterns	3		Procedural Task	2	2	Finding a general term of a quadratic pattern
		2.2.3	Quadratic Patterns	3		Procedural Task	3	3	Working on a quadratic pattern, interpreting solutions in relation to the real number system

		3.1.1	Geometric sequence	1		Recall	1	1	Working on a geometric sequence
		3.1.2	Geometric series	4		Procedural Task	2	2	Evaluating sigma notation
		3.2	Geometric & arithmetic sequences	5		Procedural Task	3	3	Evaluating two patterns & working out a solution
2024	✓	2.1.1	Arithmetic series	2	24	Procedural Task	1	1	Calculating the sum of an arithmetic series
		2.1.2	Sigma notation	4		Procedural Task	2	2	Writing in sigma notation
		2.2.1	Quadratic Patterns	3		Procedural Task	2	2	Working on a quadratic pattern
		2.2.2	Quadratic Patterns	5		Procedural Task	2	2	Working on a quadratic pattern
		3.1	Geometric sequence	2		Procedural Task	1	1	Working on a geometric pattern
		3.2	Geometric series	4		Procedural Task	2	2	Working on a geometric pattern
		3.3	Geometric sequence	4		Procedural Task	1	2	Working on a geometric pattern

Table 3.1.3 presents a comparative overview of the Patterns and Sequences topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.1.3 have contributed to the predictability of the DBE Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Patterns and Sequences topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised in particular questions in the examination question papers, as was the case during the period under review. The subtopics that constitute Patterns and Sequences are arranged in the same manner each year. This arrangement is not strictly a requirement of the CAPS. The format affects the difficulty and cognitive demand of the subtopics. The items in a question are arranged from the easy to the challenging levels. The overall arrangement affects the subtopics' weighting, item types, topic–skill pairing, and item framing. These will be discussed in subsequent sections below.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic every year; the consistent presence and arrangement of the subtopics in the examination question papers suggest a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics Curriculum and Mathematics SAGs prescribe that 25 marks of the total marks of the examination question papers should be allocated to Patterns and Sequences, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Patterns and Sequences has remained largely consistent across the three years, with each paper assigning 25 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Patterns and Sequences subtopics; the same item types are used over the years. In all three years, the Patterns and Sequences of items are procedural. Moreover, the levels of difficulty, cognitive levels, and the mark allocation for the items remain consistent, resulting in the examination question papers having the same format, structure, and tone each year. These patterns make the examination question papers fairly predictable, although calming for the candidates. According to the CAPS, contextual questions should be applied to any topic, and the integration of topics is supported. The lack of variation in item types leads to predictable outcomes, which may be mitigated by including contextual questions within Patterns and Sequences and by integrating some subtopics. Topics and subtopics should not be treated in isolation within examination questions; rather, their integration must constitute a fundamental component of every examination question paper.

e. Topic and skill pairing

The analysis indicates that under Patterns and Sequences, the topic–skill combinations remain relatively similar over the three-year period. The items are in the same form and style; this means the same skills and approaches are assessed. The underlying structure of the items remains relatively similar, allowing the candidates to demonstrate procedural fluency on items of equivalent difficulty. The yearly changes in the item types used in Patterns and Sequences will alter topic–skill combinations and make the paper less

predictable. The topic–skill combinations may be changed by moving from simply working on a pattern or sequence to explaining why a method works, finding errors in solutions, justifying solutions, comparing strategies, and using real-world problems (modelling). The change in the item types will affect the levels of cognitive demand and the difficulty of items. These changes will necessitate shifting the topic from its current position, which will affect the overall structure of the papers and make the examination question papers less predictable. However, the change may also affect the fairness and accessibility of the examination question papers; these papers are kept relatively similar and predictable to avoid bias and ensure that test items are clear to all candidates.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items across 2022–2024 reflects both consistency in structure and presentation, with a focus mainly on procedural fluency and a consistent item difficulty. The framing is free of conceptual and application items (except in parts where such items are expected), and items that promote strategic thinking and allow candidates to solve problems. Only the last items in Question 1 are often framed differently and do not relate to the same subtopic each year; this is a predictable trend. This practice renders the items in the examination question papers to be framed in a similar way and consequently predictable. This can be avoided by ensuring that the items are not framed the same way year on year. Items can be framed differently by moving from abstract concepts to applied contexts (e.g., by varying item types) and by varying the difficulty and demand of similar subtopics each year.

Summary of findings and recommendations for the DBE Mathematics Patterns and Sequences topic

Table 3.1.4 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.1.4: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Patterns and Sequences Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Questions 2 and 3 fully justified. However, the items are ordered in a similar way every year, making this section predictable. This issue will be discussed in detail under 'item types.'
Recommendations to avoid unacceptable predictability on topic coverage
The DBE should consider the following to minimise predictability: • Patterns and Sequences should not be Questions 2 and 3 every year (order the topics differently annually) • Vary the difficulty and cognitive demand of subtopics every year; this can be done by: o Integrating topics/subtopics beyond the usual areas, which requires careful handling o Ensuring that the topic weighting is not affected
Identified unacceptable predictability on content coverage
No unacceptable predictability identified. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS

outlines subtopics; the question papers covered them appropriately as required by the CAPS, and the adherence indicates predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
The DBE should continue to ensure that the examination question papers cover Patterns and Sequences and their subtopics as required by CAPS. However, there should be a variation of item types every year to reduce predictability.
Strategies to maintain content coverage that do not lead to a predictable question paper
Decompartmentalise sections or questions by integrating topics into a single question. Include a variety of items; items should not be in abstract form only but also based on context and real-world problems (modelling).
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 25 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
None, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that does not lead to a predictable question paper
The DBE should vary subtopic mark distribution by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on item types
In Patterns and Sequences, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.

Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Patterns and Sequences of items that require candidates to explain, interpret, compare or justify solutions, not only calculations. Include items where topics are integrated.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
The DBE should vary item types by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on topic–skill pairing
The analysis indicates strong repetition of fixed topic–skill combinations. The subtopics and matching skills in Patterns and Sequences remain relatively similar from year-to-year. Items are kept in a conventional way, with little to no expected variation. Subtopics are in the same form and style, requiring the same set of skills and approach.
Recommendations to avoid unacceptable predictability through topic–skill pairing
Limit the repetition of identical skill chains from year-to-year. Develop topic–skill matrices that encourage a greater variety of skills throughout the examination question papers, rather than relying on the same small set of routine procedures. Intentionally introduce cross-topic items (e.g., patterns with functions) to disrupt fixed pairings and promote integrated reasoning. Minimise assessing the same skill several times.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
The DBE should vary topic–skill pairing by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems

• Varying the difficulty and cognitive demand on items
Identified unacceptable predictability in the scenario framing of items
No unacceptable predictability. The patterns observed indicate that framing in Patterns and Sequences of items across 2022–2024 is inconsistent in structure, wording, and presentation. However, the items focus on procedural fluency. The framing is free of items that promote strategic thinking and allow candidates to solve problems.
Recommendations to avoid unacceptable predictability in scenario framing of items
The DBE should ensure that items are not only framed differently but are challenging enough for the top set. Include items that require strategic thinking and allow candidates to solve problems.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Ensure the items are framed to include easy, moderate, challenging, and advanced items: • Decompartmentalise sections, integrating topics into a single question • Vary the difficulty and cognitive demand on items

Table 3.1.5 below summarises the analysis conducted to determine the level of predictability for the Functions and Graphs Topic in DBE Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.1.5: Findings on the Predictability of the Functions and Graphs Topic for the DBE Mathematics Paper 1 Examinations from 2022–2024

Topic: Functions and Graphs									
Year	**Topic Examined**	**Content/Topic(s) covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	4.1.1	Hyperbolic functions	2	26	Procedural	1	1	Evaluation parameters of a hyperbola
		4.1.2	Hyperbolic functions	2		Procedural	1	2	Finding the intercepts of a hyperbola
		4.1.3	Transformation in functions	2		Procedural	1	2	Transformation
		4.1.4	Symmetries of a hyperbola	2		Procedural	2	2	Determining the axis of symmetry
		4.1.5	Straight line and hyperbola	3		Procedural	2	3	Interpretation in functions
		4.2.1	Parabolic functions	1		Procedural	1	1	Finding the intercepts of a parabola
		4.2.2	Parabolic functions	2		Procedural	1	2	Finding the turning point of a parabola

		4.2.3	Exponential functions	3		Procedural	1	2	Evaluation parameters of an exponential function
		4.2.4	Exponential functions	1		Procedural	1	1	Determining the range of an exponential function
		4.2.5	Transformation in functions	2		Procedural	3	3	Interpretation
		5.1	Linear functions	1		Procedural	1	1	Finding the intercepts of a straight line
		5.2	Inverse functions	2		Procedural	1	2	Determining the inverse of a straight line
		5.3	Linear functions	3		Procedural	1	2	Determining the point of intersection of straight lines
2023	✓	4.1	Exponential functions	1	32	Procedural	1	1	Understanding the parameters of an exponential function

		4.2	Exponential functions	2		Procedural	1	2	Finding the intercepts of an exponential function
		4.3	Linear functions	3		Procedural	1	2	Equation of a straight line
		4.4	Linear and exponential functions	3		Procedural	1	2	Finding a distance between two functions
		4.5	Transformation in functions	1		Procedural	1	1	translations of functions
		4.6	Inverse functions	2		Procedural	2	2	Working on inverse functions
		4.7	Inverse functions	2		Procedural	1	1	Working on inverse functions
		5.1	Parabolic functions	2		Procedural	1	1	Working on a parabola
		5.2	Hyperbolic functions	2		Procedural	1	1	Working on a hyperbola
		5.3	Parabolic functions	1		Procedural	1	1	Working on a parabola
		5.4	Hyperbolic functions	1		Procedural	1	1	Finding the range of a hyperbolic function

		5.5	Parabolic and hyperbolic functions	3		Procedural	2	2	Interpretation in functions
		5.6	Straight line and hyperbola	5		Procedural	3	3	Evaluation of two functions
		5.7	Straight line and hyperbola	4		Problem-solving	4	4	Working with the tangent to a function
2024	✓	4.1	Exponential functions	2	34	Procedural	1	2	Substitution
		4.2	Exponential functions	1		Procedural	1	1	Finding the range of an exponential function
		4.3	Exponential functions	3		Procedural	2	2	Sketching an exponential function
		4.4	Transformation in functions	3		Procedural	2	2	Transformation
		5.1	Hyperbolic functions	1		Procedural	1	1	Evaluation of parameters of a hyperbola
		5.2	Hyperbolic functions	2		Procedural	1	1	Finding asymptotes of a hyperbola

		5.3	Hyperbolic functions	2		Procedural	1	2	Evaluation parameters of a hyperbola
		5.4	Hyperbolic functions	3		Procedural	2	2	Interpretation
		5.5	Transformation in functions	2		Problem-solving	2	4	Interpretation in functions
		6.1	Parabolic functions	3		Procedural	1	2	Finding the turning point of a parabola
		6.2	Linear and Parabolic functions	3		Procedural	1	2	Working with two functions
		6.4	Transformation in functions	5		Problem-solving	3	4	Conceptual clarity about tangents and functions
		8.3.2	Inverse functions	1		Procedural	1	1	Working on the inverse of a parabola
		8.3.3	Inverse functions	3		Procedural	2	2	Working on the inverse of a parabola

Table 3.1.5 presents a comparative overview of the Functions and Graphs topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.1.5 have contributed to the predictability of the DBE Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Functions and Graphs topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised in particular questions of the examination question papers, as was the case during the period under review. The subtopics that constitute Functions are arranged in the same manner each year, and this arrangement is not strictly a requirement of the CAPS. The format affects the difficulty and cognitive demand of the subtopics. The items in a question are arranged from the easy to the challenging levels. The overall arrangement affects the subtopics' weighting, item types, topic–skill pairing, and item framing. These will be discussed in subsequent sections below.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of the subtopics in the examination question papers suggest a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics CAPS prescribes that 35 marks of the total marks of the examination question papers should be allocated to Functions, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Functions has remained largely consistent across the three years, with each paper assigning 35 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Functions subtopics; the same item types are used over the years. In all three years, the Functions items are procedural. Moreover, the levels of difficulty, cognitive levels, and mark allocation for the items remain consistent, resulting in the examination question papers having the same format, structure, and tone each year. These patterns make the examination question papers fairly predictable, although calming for the candidates. According to the CAPS, contextual questions should be applied to any topic, and the integration of topics is supported. The lack of variation in item types leads to predictable outcomes, which may be mitigated by including contextual questions in Functions and integrating additional subtopics. Topics and subtopics should not be treated in isolation within examination questions; rather, their integration must constitute a fundamental component of every examination question paper.

e. Topic and skill pairing

The analysis indicates that under Functions the topic–skill combinations remain relatively similar over the three-year period. The items are in the same form and style; this means the same skills and approaches are assessed. The underlying structure of the items remains relatively similar, allowing the candidates to demonstrate procedural fluency on items of equivalent difficulty. The yearly changes in the item types used in Functions will alter topic–skill combinations and make the paper less predictable. The topic–skill combinations

may be changed by moving from simply evaluating function parameters to explaining why a method works, finding errors in solutions, justifying solutions, comparing strategies, and using real-world problems (modelling). The change in the item types will affect the levels of cognitive demand and the difficulty of items. These changes will necessitate shifting the topic from its current position, which will affect the overall structure of the papers and make the examination question papers less predictable. However, the change may also affect the fairness and accessibility of the examination question papers; these papers are kept relatively similar and predictable to avoid bias and ensure that test items are clear to all candidates.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items across 2022–2024 reflects both consistency in structure and presentation, with a focus mainly on procedural fluency, and consistency in item difficulty. The framing is free of conceptual and application items (except in sections where such items are expected) and includes items that promote strategic thinking and enable candidates to solve problems. Only the last item in Question 1 is often framed differently and does not relate to the same subtopic each year; this is a predictable trend. This practice renders the items in the examination question papers similar and, consequently, predictable. This can be avoided by ensuring that the items are not framed the same way year on year. Items can be framed differently by moving from abstract concepts to applied contexts (e.g., by varying item types) and by altering the difficulty and demand of similar subtopics each year.

Summary of findings and recommendations for the DBE Mathematics Functions and Graphs topic

Table 3.1.6 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.1.6: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Functions and Graphs Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Questions 4 and 5 fully justified. However, the items are ordered in a similar way every year, making this section predictable. This issue will be discussed in detail under 'item types.'
Recommendations to avoid unacceptable predictability on topic coverage
The DBE should consider the following to minimise predictability: • Functions should not be Questions 4 and 5 every year (order the topics differently annually) • Vary the difficulty and cognitive demand of subtopics every year; this can be done by: o Integrating topics/subtopics beyond the usual areas, which requires careful handling o Ensuring that the topic weighting is not affected
Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics;

the question papers covered them appropriately as required by the CAPS, and this adherence indicates predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
The DBE should continue to ensure that the examination question papers cover Patterns and Sequences and their subtopics as required by CAPS. However, there should be a variation of item types every year to reduce predictability.
Strategies to maintain content coverage that do not lead to a predictable question paper
Decompartmentalise sections or questions by integrating topics into a single question. Include a variety of items; items should not be in abstract form only but also based on context and real-world problems (modelling).
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 35 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
None, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
The DBE should vary subtopic mark distribution by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on item types
In Patterns and Sequences, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.

Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Patterns and Sequences of items that require candidates to explain, interpret, compare or justify solutions, not only calculations. Include items where topics are integrated.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
The DBE should vary item types by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on topic–skill pairing
The analysis indicates strong repetition of fixed topic–skill combinations. The subtopics and matching skills in Functions remain relatively similar from year-to-year. Items are kept in a conventional way, with little to no expected variation. Subtopics are in the same form and style, requiring the same set of skills and approach.
Recommendations to avoid unacceptable predictability through topic–skill pairing
Limit the repetition of identical skill chains from year-to-year. Develop topic–skill matrices that encourage greater variety of skills throughout the examination question papers, rather than relying on the same small set of routine procedures. Intentionally introduce cross-topic items (e.g., patterns with functions) to disrupt fixed pairings and promote integrated reasoning. Minimise the need to assess the same skill several times.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
The DBE should vary topic–skill pairing by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems

• Varying the difficulty and cognitive demand on items
Identified unacceptable predictability in the scenario framing of items
No unacceptable predictability. The observed pattern indicates that framing in Patterns and Sequences of items across 2022–2024 reflects inconsistency in structure, wording, and presentation. However, the items focus on procedural fluency. The framing is free of items that promote strategic thinking and allow candidates to solve problems.
Recommendations to avoid unacceptable predictability in scenario framing of items
The DBE should ensure that items are not only framed differently but also challenging enough for the top set. Include items that require strategic thinking and allow candidates to solve problems.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Ensure the items are framed to include easy, moderate, challenging, and advanced items: • Decompartmentalise sections, integrating topics into a single question • Vary the difficulty and cognitive demand on items

Table 3.1.7 summarises the analysis conducted to determine the level of Predictability for the Finance topic for DBE Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.1.7: Findings on the Predictability of the Finance Topic for the DBE Mathematics Paper 1 Examinations from 2022–2024

Topic: Finance									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	X	6.1	Compound interest	4	14	Procedural Task	1	2	Using the compound formula
		6.2	Future value of annuities	4		Procedural Task	2	2	Using the future value formula
		6.3.1	Percentages	1		Procedural Task	1	2	Working with percentages
		6.3.2	Present value of annuities	5		Procedural Task	2	2	Loan repayment, using the present value formula
2023	X	6.1.1	Compound interest	3	16	Procedural Task	1	2	Using the compound interest formula
		6.1.2	Effective rate	2		Procedural Task	1	2	Using the effective rate formula
		6.2.1	Straight line depreciation	2		Procedural Task	1	2	Using the depreciation formula (straight line)
		6.2.2	Future value of annuities	4		Procedural Task	2	2	Using the future value formula
		6.3	Present value of annuities	5		Procedural Task	2	2	Using the present value formula
2024	X	7.1	Compound interest	3	14	Procedural Task	1	2	Using the compound interest formula
		7.2	Straight line depreciation	2		Procedural Task	1	2	Using the depreciation formula (straight line)

		7.3.1	Present value of annuities	2		Procedural Task	1	2	Calculating interest
		7.3.2	Present value of annuities	7		Procedural Task	3	3	Using the present value formula

Table 3.1.7 presents a comparative overview of the Finance topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.1.7 have contributed to the predictability of the DBE Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Finance topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised within specific questions in the examination question papers, as was the case during the period under review. The subtopics that constitute Finance are arranged in the same manner each year; this arrangement is not strictly a requirement of CAPS. The format affects the difficulty and cognitive demand of the subtopics. The items in a question are arranged from the easy to the challenging levels. The overall arrangement affects the subtopics' weighting, item types, topic–skill pairing, and item framing. These will be discussed in subsequent sections below.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of subtopics in examination question papers indicate a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 15 marks of the total marks of the examination question papers should be allocated to Finance, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Finance has remained largely consistent across the three years, with each paper assigning 15 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Finance subtopics; the same item types are used over the years. In all three years, the Finance items are procedural. Moreover, the levels of difficulty, cognitive levels, and the mark allocation for the items remain consistent, resulting in the examination question papers having the same format, structure, and tone each year. These patterns make the examination question papers fairly predictable, although calming for the candidates. According to CAPS, contextual questions should be applied to any topic, and the integration of topics is supported. The lack of variation in item types leads to predictable outcomes, which may be mitigated by including contextual questions in Finance and by integrating some subtopics. Topics and subtopics should not be treated in isolation within examination questions; rather, their integration must constitute a fundamental component of every examination question paper.

e. Topic and skill pairing

The analysis indicates that under Finance, the topic–skill combinations remain relatively similar over the three-year period. The items are in the same form and style; this means the same skills and approaches are assessed. The underlying structure of the items remains relatively similar, allowing the candidates to demonstrate procedural fluency on items of equivalent difficulty. The change in the item types used in Finance will alter topic–skill combinations and make the paper less predictable. The topic–skill combinations may be changed by moving from simply using formulae to explaining why a method works, finding errors in solutions, justifying solutions, comparing strategies, and using real-world problems (modelling). The change in the item types will affect the levels of cognitive demand and the difficulty of items. These changes will necessitate shifting the topic from its current position (e.g., Question 6) and will affect the overall structure of the papers, making the examination question papers less predictable. However, the change may also affect the fairness and accessibility of the examination question papers; these papers are kept relatively similar and predictable to avoid bias and ensure that test items are clear to all candidates.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items across 2022–2024 reflects both consistency in structure and presentation, with a focus mainly on procedural fluency, and consistency in item difficulty. The framing is free of conceptual and application items (except in sections where such items are expected) and includes items that promote strategic thinking and enable candidates to solve problems. Only the last item in Question 1 is often framed differently and does not relate to the same subtopic each year; this is a predictable trend. This practice renders the items in the examination question papers similar and, consequently, predictable. This can be avoided by ensuring that the items are not framed the same way year on year. Items can be framed differently by moving from abstract concepts to applied contexts (e.g., varying the item types) and by altering the difficulty and demand of similar subtopics each year.

Summary of findings and recommendations for the DBE Mathematics Finance topic

Table 3.1.8 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.1.8: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Finance Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Question 6 fully justified. However, the items are ordered in a similar way every year, making this section predictable. This issue will be discussed in detail under 'item' types.
Recommendations to avoid unacceptable predictability on topic coverage

The DBE should consider the following to minimise predictability:
• Finance should not be Question 6 every year (order the topics differently annually)
• Vary the difficulty and cognitive demand of subtopics every year; this can be done by:
  o Integrating topics/subtopics beyond the usual areas, which requires careful handling
  o Ensuring that the topic weighting is not affected

Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics;

the question papers covered them appropriately as required by the CAPS, and the adherence indicates predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
The DBE should continue to ensure that the examination question papers cover Patterns and Sequences and their subtopics as required by CAPS. However, there should be a variation of item types every year to reduce predictability.
Strategies to maintain content coverage that do not lead to a predictable question paper
Decompartmentalise sections or questions by integrating topics into a single question. Include a variety of items; items should not be in abstract form only but also based on context and real-world problems (modelling).
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 15 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
None, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
The DBE should vary subtopic mark distribution by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on item types
In Patterns and Sequences, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.

Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Patterns and Sequences of items that require candidates to explain, interpret, compare or justify solutions, not only calculations. Include items where topics are integrated.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
The DBE should vary item types by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on topic–skill pairing
The analysis indicates strong repetition of fixed topic–skill combinations. The subtopics and matching skills in Finance remain relatively similar from year-to-year. Items are kept in a conventional way, with little to no expected variation. Subtopics are in the same form and style, requiring the same set of skills and approach.
Recommendations to avoid unacceptable predictability through topic–skill pairing
Limit the repetition of identical skill chains from year to year. Develop topic–skill matrices that encourage greater variety of skills throughout the examination question papers, rather than relying on the same small set of routine procedures. Intentionally introduce cross-topic items (e.g., patterns with functions) to disrupt fixed pairings and promote integrated reasoning. Minimise assessing the same skill several times.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
The DBE should vary topic–skill pairing by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems

• Varying the difficulty and cognitive demand on items
Identified unacceptable predictability in the scenario framing of items
No unacceptable predictability. The patterns observed indicate that framing in Patterns and Sequences of items across 2022–2024 reflects inconsistencies in structure, wording, and presentation. However, the items focus on procedural fluency. The framing is free of items that promote strategic thinking and allow candidates to solve problems.
Recommendations to avoid unacceptable predictability in scenario framing of items
The DBE should ensure that items are not only framed differently but are challenging enough for the top set. Include items that require strategic thinking and allow candidates to solve problems.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Ensure the items are framed to include easy, moderate, challenging, and advanced items: • Decompartmentalise sections, integrating topics into a single question • Vary the difficulty and cognitive demand on items

Table 3.1.9 summarises the analysis conducted to determine the level of predictability for the Calculus topic for DBE Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.1.9: Findings on the Predictability of the Calculus Topic for the DBE Mathematics Paper 1 Examinations from 2022–2024

Topic: Calculus									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	x	7.1	Differentiation	5	37	Procedural	2	2	Using first principles
		7.2	Differentiation	3		Procedural	1	2	Using the rules for differentiation
		7.3	Cubic functions	4		Procedural	3	3	Working from gradients to the function
		8.1	Quadratic function	6		Procedural	2	2	Determining the equation of a parabola
		8.2.1	Cubic functions	3		Procedural	2	2	Finding the turning point of a cubic function
		8.2.2	Cubic functions	5		Procedural	2	2	Drawing a cubic function
		8.3.1	Tangents, gradients and lines	1		Procedural	1	1	Tangents from the same point

		8.3.2	Tangents, gradients and lines	2		Procedural	3	3	Understanding the relation of tangents to the functions
		9	Application of Calculus	8		Procedural	3	3	Setting up an equation based on the given information and optimising
2023	x	7.1	Differentiation	5	37	Procedural	2	2	Using the first principles
		7.2.1	Differentiation	2		Procedural	1	2	Using the rules for differentiation
		7.2.2	Differentiation	3		Procedural	2	3	Using the rules for differentiation
		7.3	Tangents, gradients and lines	3		Procedural	2	2	Understanding the relation of tangents to the functions
		8.1	Cubic functions	4		Procedural	1	2	Finding the turning point of a cubic function
		8.2	Cubic functions	4		Procedural	2	2	Drawing a cubic function
		8.3	Cubic functions	2		Procedural	2	1	Translations of functions
		8.4	Cubic functions	6		Procedural	2	3	Finding a tangent to a cubic function

		8.5	Cubic functions	2		Procedural	2	2	Finding an angle between a line and the x-axis
		9.1	Application of Calculus	3		Procedural	3	3	Setting up an equation based on the given information
		9.2	Application of Calculus	3		Procedural	2	2	Optimisation
2024	x	6.3	Linear and Parabolic functions	4	34	Procedural	2	2	Evaluating the length between two functions
		8.1.1	Differentiation	2		Procedural	1	2	Using the rules for differentiation
		8.1.2	Differentiation	4		Procedural	2	2	Using the rules for differentiation
		8.2	Tangent to a curve	3		Procedural	2	2	Finding a tangent of a cubic function
		8.3.1	Differentiation	5		Procedural	2	2	Using first principles

		9.1	Cubic functions	2		Procedural	1	1	Evaluating the gradients along a cubic curve
		9.2	Cubic functions	2		Recall	1	1	Relating the turning points of a cubic function to the behaviour of its gradients
		9.3	Cubic functions	2		Procedural	1	1	Judging concavity
		9.4	Cubic functions	2		Procedural	2	1	Transformation in functions
		10.1	Application of Calculus	3		Procedural	2	2	Understanding what maximum means in context and relevant calculations
		10.2	Application of Calculus	5		Procedural	3	3	Working back to the integral based on the context and calculating accordingly

Table 3.1.9 presents a comparative overview of the Calculus topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.1.9 have contributed to the predictability of the DBE Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Calculus topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised in particular questions of the examination question papers, as was the case during the period under review. The subtopics that constitute Calculus are arranged in the same manner each year. This arrangement is not strictly a requirement of the CAPS. The format affects the difficulty and cognitive demand of the subtopics. The items in a question are arranged from the easy to the challenging levels. The overall arrangement affects the subtopics' weighting, item types, topic–skill pairing, and item framing. These will be discussed in subsequent sections below.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of subtopics in examination question papers indicate a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 35 marks of the total marks of the examination question papers should be allocated to Calculus, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Calculus has remained largely consistent across the three years, with each paper assigning 35 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Calculus subtopics; the same item types are used over the years. In all three years, the Calculus items are procedural. Moreover, the levels of difficulty, cognitive levels, and the mark allocation for the items remain consistent, resulting in the examination question papers having the same format, structure, and tone each year. These patterns make the examination question papers fairly predictable, although calming for the candidates. According to the CAPS, contextual questions should be applied to any topic, and the integration of topics is supported. The lack of variation in item types leads to predictable outcomes, which may be mitigated by including contextual questions in Calculus and integrating some subtopics. Topics and subtopics should not be treated in isolation within examination questions; rather, their integration must constitute a fundamental component of every examination question paper.

e. Topic and skill pairing

The analysis indicates that under Calculus the topic–skill combinations remain relatively similar over the three-year period. The items are in the same form and style as in the classroom activities; this means the same skills and approaches are assessed. The underlying structure of the items remains relatively similar, allowing the candidates to demonstrate procedural fluency on items of equivalent difficulty. The change in the item types used in Calculus will alter topic–skill combinations and make the paper less predictable. The

topic–skill combinations may be changed by moving from simply differentiating to explaining why a method works, finding errors in solutions, justifying solutions and comparing strategies. When using real-world problems (modelling), the problems should not always be scaffolded. The change in the item types will affect the levels of cognitive demand and the difficulty of items. These changes will necessitate shifting the topic from its current position, and that will affect the overall structure of the papers and make the examination question papers less predictable. However, the change may also affect the fairness and accessibility of the examination question papers; these papers are kept relatively similar and predictable to avoid bias and ensure that test items are clear to all candidates.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items across 2022–2024 reflects both consistency in structure and presentation, with a focus mainly on procedural fluency and item-difficulty consistency. The framing is free of conceptual and application items (except in parts where such items are expected) and includes items that promote strategic thinking and enable candidates to solve problems. Only the last items in Question 1 are often framed differently and do not relate to the same subtopic each year; this is a predictable trend. This practice renders the items in the examination question papers similar and, consequently, predictable. This can be avoided by ensuring that the items are not framed the same way year on year. Items can be framed differently by moving from abstract concepts to applied contexts (e.g., varying item types) and altering the difficulty and demand of similar subtopics each year.

Summary of findings and recommendations for the DBE Mathematics Calculus topic

Table 3.1.10 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.1.10: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Calculus Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Questions 7, 8, and 9 fully justified. However, the items are ordered in a similar way every year, making this section predictable. This issue will be discussed in detail under 'item' types.
Recommendations to avoid unacceptable predictability on topic coverage

The DBE should consider the following to minimise predictability:
• Patterns and Sequences should not be Questions 7, 8, and 9 every year (order the topics differently annually)
• Vary the difficulty and cognitive demand of subtopics every year; this can be done by:
  o Integrating topics/subtopics beyond the usual areas, which requires careful handling
  o Ensuring that the topic weighting is not affected

Identified unacceptable predictability on content coverage
There is no unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS

outlines subtopics; the question papers covered them appropriately as required by the CAPS, and this adherence indicates some predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
The DBE should continue to ensure that the examination question papers cover Patterns and Sequences and their subtopics as required by CAPS. However, there should be a variation of item types every year to reduce predictability.
Strategies to maintain content coverage that do not lead to a predictable question paper
Decompartmentalise sections or questions by integrating topics into a single question. Include a variety of items; items should not be in abstract form only, but also be based on context and real-world problems (modelling).
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 35 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
There are none, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
The DBE should vary subtopic mark distribution by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on item types

In Patterns and Sequences, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Patterns and Sequences of items that require candidates to explain, interpret, compare or justify solutions, not only calculations. Include items where topics are integrated.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
The DBE should vary item types by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on topic–skill pairing
The analysis indicates strong repetition of fixed topic–skill combinations. The subtopics and matching skills in Calculus remain relatively similar from year-to-year. Items are kept in a conventional way, with little to no expected variation. Subtopics are in the same form and style, requiring the same set of skills and approach.
Recommendations to avoid unacceptable predictability through topic–skill pairing
Limit the repetition of identical skill chains from year-to-year. Develop topic–skill matrices that encourage a greater variety of skills throughout the examination question papers, rather than relying on the same small set of routine procedures.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
The DBE should vary topic–skill pairing by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems

• Varying the difficulty and cognitive demand on items
Identified unacceptable predictability in the scenario framing of items
No unacceptable predictability. The patterns observed indicate that framing in Patterns and Sequences of items across 2022–2024 is inconsistent in structure, wording, and presentation. However, the items focus on procedural fluency. The framing is free of items that promote strategic thinking and allow candidates to solve problems.
Recommendations to avoid unacceptable predictability in scenario framing of items
The DBE should ensure that items are not only framed differently but also challenging enough for the top set. Include items that require strategic thinking and allow candidates to solve problems.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Ensure the items are framed to include easy, moderate, challenging, and advanced items: • Decompartmentalise sections, integrating topics into a single question • Vary the difficulty and cognitive demand on items

Table 3.1.11 summarises the analysis conducted to determine the level of predictability for the Probability for DBE Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.1.11: Findings on the Predictability of the Probability for the DBE Mathematics Paper 1 Examinations from 2022–2024

Topic: Probability									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	X	10.1.1a	Venn diagram	1	17	Procedural Task	1	1	Working on a Venn diagram
		10.1.1b	Venn diagram	1		Procedural Task	1	1	Working on a Venn diagram
		10.1.2	Venn diagram	2		Procedural Task	2	2	Calculating the probability
		10.1.3	Independent events	5		Procedural Task	2	2	Evaluating independent events
		10.2.1	Fundamental counting principles	3		Problem-solving	4	4	Counting arrangements
		10.2.2	Fundamental counting principles	5		Problem-solving	4	4	Counting arrangements
2023	X	10.1.1	Independent events	2	15	Procedural Task	1	1	Evaluating independent events
		10.1.2	Inclusive rule	2		Procedural Task	1	1	Using the inclusive rule
		10.2.1	Free diagram	3		Procedural Task	2	2	Drawing a tree diagram
		10.2.2	Free diagram	3		Procedural Task	2	3	Calculating probability based on tree diagram

		10.3.1	Fundamental counting principles	1		Procedural Task	1	1	Counting arrangements
		10.3.2	Fundamental counting principles	4		Problem-solving	4	4	Counting arrangements
2024	X	11.1	Venn diagram	3	17	Procedural Task	2	2	Drawing on a Venn diagram
		11.2	Venn diagram	2		Procedural Task	1	2	Working with a Venn diagram
		11.3	Independent events	4		Procedural Task	2	2	Evaluating independent events
		12.1	Fundamental counting principles	2		Procedural Task	2	2	Counting arrangements
		12.2	Fundamental counting principles	4		Procedural Task	2	4	Counting arrangements
		12.3	Fundamental counting principles	2		Problem-solving	4	4	Counting arrangements

Table 3.1.11 presents a comparative overview of the Probability topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.1.11 have contributed to the predictability of the DBE Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Probability topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised within specific questions in the examination question papers, as was the case during the period under review. The subtopics that constitute Probability are arranged in the same manner each year. This arrangement is not strictly a requirement of the CAPS. The format affects the difficulty and cognitive demand of the subtopics. The items in a question are arranged from easiest to most challenging. The overall arrangement affects the subtopics' weighting, item types, topic–skill pairing, and item framing. These will be discussed in subsequent sections below.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of subtopics in the examination question papers indicate predictability. That is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 15 marks of the total marks of the examination question papers should be allocated to Probability, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Probability has remained largely consistent across the three years, with each paper assigning 15 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Probability subtopics; the same item types are used over the years. In all three years, the Probability items are procedural. Moreover, the levels of difficulty, cognitive levels, and mark allocation for the items remain consistent, resulting in the examination question papers having the same format, structure, and tone each year. These patterns make the examination question papers fairly predictable, although calming for the candidates. According to the CAPS, contextual questions should be applied to any topic, and the integration of topics is supported. The lack of variation in item types results in predictable outcomes, which may be reversed by including contextual questions in Probability and integrating some subtopics. Topics and subtopics should not be treated in isolation within examination questions; rather, their integration must constitute a fundamental component of every examination question paper.

e. Topic and skill pairing

The analysis indicates that in terms of Probability, the topic–skill combinations remain relatively similar over the three-year period. The items are in the same form and style; this means the same skills and approaches are assessed. The underlying structure of the items remains relatively similar, allowing the candidates to demonstrate procedural fluency on items of equivalent difficulty. The change in the item types used in Probability will alter change in topic–skill combinations and make the paper less predictable. The topic–skill combinations may be changed by moving from simply calculating probabilities and arrangements to explaining why a method works, finding error solutions, justifying solutions and comparing strategies. The change in the item types will affect the levels of cognitive demand and the difficulty of items. These changes will necessitate shifting the topic from its current position (e.g., Question 10) and will affect the overall structure of the papers, making the examination question papers less predictable. However, the change may also affect the fairness and accessibility of the examination question papers; these papers are kept relatively similar and predictable to avoid bias and ensure that test items are clear to all candidates.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the examination question papers analysed indicate that the framing of topic items across 2022–2024 reflects both consistency in structure and presentation, with a focus mainly on procedural fluency and a consistent item difficulty. The framing is free of conceptual and application items (except in sections where such items are expected), and includes items that promote strategic thinking and enable candidates to solve problems. Only the last item in Question 1 is often framed differently and does not relate to the same subtopic each year; this is a predictable trend. This practice renders the items in the examination question papers similar and, consequently, predictable. This can be avoided by ensuring that the items are not framed the same way year on year. Items can be framed differently by moving from abstract concepts to applied contexts (e.g., by varying item types) and by altering the difficulty and demand of similar subtopics each year.

Summary of findings and recommendations for the DBE Mathematics Probability topic

Table 3.1.12 summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.1.12: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Probability Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Question 10 fully justified. However, the items are ordered in the same way every year, making this section predictable. This issue will be discussed in detail under 'item' types.

Recommendations to avoid unacceptable predictability on topic coverage

The DBE should consider the following to minimise predictability:
• Probability should not be in the same question every year (order the topics differently annually)
• Vary the difficulty and cognitive demand of subtopics every year; this can be done by:
  o Integrating topics/subtopics beyond the usual areas, which requires careful handling
  o Ensuring that the topic weighting is not affected

Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and the adherence indicates predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
The DBE should continue to ensure that the examination question papers cover Patterns and Sequences and their subtopics as required by CAPS. However, there should be a variation of item types every year to reduce predictability.
Strategies to maintain content coverage that do not lead to a predictable question paper
Decompartmentalise sections or questions by integrating topics into a single question. Include a variety of items; items should not be in abstract form only, but also be based on context and real-world problems (modelling).
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 15 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting

There is none, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
The DBE should vary subtopic mark distribution by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on item types
In Probability, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Probability items that require candidates to explain, interpret, compare or justify solutions, not only calculations. Include items where topics are integrated.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
The DBE should vary item types by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability on topic–skill pairing
The analysis indicates strong repetition of fixed topic–skill combinations. The subtopics and matching skills in Probability remain relatively similar from year-to-year. Items are kept in a conventional way, with little to no expected variation. Subtopics are in the same form and style, requiring the same set of skills and approach.

Recommendations to avoid unacceptable predictability through topic–skill pairing
Limit the repetition of identical skill chains from year-to-year. Develop topic–skill matrices that encourage a greater variety of skills throughout the examination question papers, rather than relying on the same small set of routine procedures. Intentionally introduce cross-topic items (e.g., Probability with functions) to disrupt fixed pairings and promote integrated reasoning. Minimise the need to assess the same skill several times.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
The DBE should vary topic–skill pairing by: • Decompartmentalising sections, integrating topics into a single question • Including items that are based on context, real-world problems • Varying the difficulty and cognitive demand on items
Identified unacceptable predictability in the scenario framing of items
There is no unacceptable predictability. The patterns observed indicate that framing in Probability items across 2022–2024 reflects inconsistency in structure, wording and presentation. However, the items focus on procedural fluency. The framing is free of items that promote strategic thinking and allow candidates to solve problems.
Recommendations to avoid unacceptable predictability in scenario framing of items
The DBE should ensure that items are not only framed differently but also challenging enough for the top set. Include items that require strategic thinking and allow candidates to solve problems.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Ensure the items are framed to include easy, moderate, challenging, and advanced items: • Decompartmentalise sections, integrating topics into a single question • Vary the difficulty and cognitive demand on items

Conclusions

Based on the evaluation of the 2022–2024 DBE Mathematics Paper 1 final examinations, the question papers demonstrate strong predictability in topic coverage, content coverage, topic weighting, item types, and topic–skill pairing. While topic coverage, content coverage, and topic weighting are curriculum requirements, item types and topic–skill pairing are assessment flaws. Firstly, the CAPS asserts that modelling as a process should be included in all papers; thus, contextual questions can be set on any topic. However, contextual questions are limited to the expected questions/items in the evaluated examination papers. Secondly, the CAPS asserts that questions will not necessarily be compartmentalised in sections. Various topics can be integrated into a single question. However, topics are mostly grouped by question in the evaluated question papers. These two factors result in very predictable examination question papers.

Setting an examination question paper is a balancing act. In practice, a balance in difficulty levels, cognitive demands, question/item types, mark allocation, content coverage, and skills assessed is often disrupted; a significant change in one element affects the others, creating unpredictability. In Mathematics, a significant change in the items is often achieved by using modelling or integrating topics. Conceptually, any significant change in questions/items affects fairness, comprehensiveness, and how candidates engage with the examination question paper. The DBE Mathematics examination question papers reflect a consistent pattern of items over the years and are therefore predictable. The design of the DBE Mathematics examination question papers may be based on templates, which restrict structural changes to the papers, leading to high predictability that is not necessarily unacceptable. There is a need to add the 'item-type,' 'topic skill pairing,' and 'framing of items' to the checklist used at the examination construction stage and to oversee adherence throughout moderation to ensure that these elements differ significantly from year to year, thus reducing predictability.

3.2: MATHEMATICS PAPER 2

This section presents an analysis of the DBE final examination question papers from 2022 to 2024 for Mathematics Paper 2 topics. The findings for each topic are summarised in Tables 3.2.1–3.2.8.

Table 3.2.1 below summarises the analysis conducted to determine the level of predictability for the Statistics topic for DBE Mathematics Paper 2 examinations from 2022 to 2024.

Table 3.2.1: Findings on the Predictability of the Statistics Topic for the DBE Paper 2 Mathematics Examinations from 2022 to 2024

Topic: Statistics									
Year	**Topic Examined**	**Content/Topic(s) Covered & Marks**			**Weight per Topic**	**Item Type**	**Difficulty Level**	**Cognitive Demand**	**Skill Assessed**
2022	✓	1.1.1	Mean	2	20	Procedural	1	1	Calculating the mean
		1.1.2	Standard deviation	1		Procedural	1	1	Calculating the σ
		1.2	Standard deviation	2		Procedural	1	2	Interpreting with 1 σ
		1.3	Regression	3		Procedural	1	2	Finding the equation of the least-squares regression
		1.4	Regression	2		Procedural	1	1	Predictions using the regression line
		1.5.1	Scatter Plot	1		Explanation	1	1	Reasoning using the scatter plot
		1.5.2	Scatter Plot	1		Explanation	1	1	Reasoning base calculations
		2.1	Ogive	1		Recall	1	1	Reading a graph

		2.2	Ogive	1		Recall	1	1	Reading a graph
		2.3	Ogive	2		Procedural	1	2	Working with % and reading a graph
		2.4	Ogive	2		Procedural	1	1	Working with %
		2.5	Ogive	2		Procedural & explanation	3	3	Predicting the transformation on the Ogive based on the calculations
2023	✓	1.1	Regression	3	20	Procedural	1	2	Finding the equation of the least-squares regression
		1.2	Regression	2		Procedural	1	1	Predictions using the regression line
		1.3	Correlation	1		Procedural	1	2	Using a calculator for the correlation
		1.4	Correlation	1		Explanation	1	1	Interpreting based on the correlation
		1.5.1	Mean	2		Procedural	1	1	Calculating the mean
		1.5.2	Standard deviation	1		Procedural	1	1	Calculating the σ
		1.5.3	Standard deviation	2		Procedural	1	2	Interpreting with 1 σ
		2.1	Cumulative table	2		Procedural	1	1	Completing the Table
		2.2	Cumulative table	1		Procedural	1	1	Reading values from the table based on a context
		2.3	Cumulative table	1		Procedural	1	1	Reading values from the table based on a context

		2.4	Mean	4		Procedural	3	3	Calculating the mean based on a context
2024	✓	1.1	Regression	3	20	Procedural	1	2	Finding the equation of the least-squares regression
		1.2	Correlation	1		Procedural	1	2	Using a calculator for the correlation
		1.3	Regression	2		Procedural	1	2	Using the regression line to predict other values
		1.4	Mean	1		Procedural	1	1	Calculating the Mean
		1.5	Standard deviation	1		Explanation	1	1	Understanding factors influencing σ
		1.6	Regression	2		Explanation	1	1	Using the graph to respond to context-based questions
		2.1	Ogive	1		Procedural	1	1	Using the Ogive to find the median
		2.2	Ogive	1		Procedural	1	1	Using the Ogive to find the lower quartile
		2.3	Ogive	2		Procedural	1	2	Using the Ogive to find the IQR
		2.4	Box-and-whisker	2		Procedural	1	2	Drawing the box-and- whisker
		2.5	Ogive	2		Problem-solving	2	4	Using the Ogive according to the context
		2.6	Ogive	2		Problem-solving	3	4	Using the Ogive according to the context

Table 3.2.1 presents a comparative overview of the Statistics topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.2.1 have contributed to the predictability of the DBE Mathematics final examination Paper 2 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Statistics topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised within a particular question (e.g., Statistics in Questions 1 and 2) of the examination question papers, as was the case during the period under review.

b. Content coverage

The CAPS requires that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of the subtopics in the examination question papers suggest a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 20 marks of the total marks of the examination question papers should be allocated to Statistics, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Statistics has remained largely consistent across the three years, with each paper assigning 20 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 2 examinations indicate little to no variation in the item types used to assess statistics subtopics. In all three years, the statistics items are primarily procedural. Furthermore, there is fair consistency in difficulty levels (e.g., averaging easy), cognitive demand, and mark allocation, ensuring that the examination papers maintain the same format and structure each year. While this regularity makes the papers relatively predictable, it also provides a sense of reassurance for candidates. The pattern is such that the last item or two is/are challenging, as was the case during the period under review.

e. Topic and skill pairing

The analysis indicates that under Statistics, there is a strong relationship between topics and skills over the three-year period. The same subtopics and skills are assessed repeatedly over the year. For example, calculating the mean, calculating the standard deviation, and more. The variations between the topics and skills are smaller; they are caused by different data representations (e.g., in table form and graphically), but they are easily detectable, as the items do not change significantly enough to affect the levels of difficulty. This results in the Statistics being predictable. The topic–skill combinations may be changed by simply moving from direct calculation (for example, calculation of the mean) to explaining (e.g., focus on meaning rather than calculations), finding an error in a solution, justifying solutions, requiring solving the unknown (e.g., using the 'mean' formula), comparing strategies (graphically vs numerically). The change in the subtopic–skill combination will affect cognitive demand and difficulty, thereby reducing predictability.

f. Scenario framing of items for a topic

In Mathematics, item framing focuses on how items are structured, worded, and presented to measure the intended skills accurately and fairly. The contexts used in each question vary, meaning the wording of the scenarios differs across 2022–2024. However, the framing in relation to the structure and presentation remains constant. Two-variable tables, scatter plots, and ogives are used. Generally, the sub-question requires candidates to perform calculations that are independent of the context, meaning one can focus on the tables, scatter plots, ogives, and frequency tables to respond to the items. This practice makes the statistics predictable. Alternatively, box-and-whisker plots may be used, and items that require candidates to demonstrate conceptual understanding rather than simple procedural fluency and the ability to use a calculator.

Summary of findings and recommendations for the DBE Mathematics Statistics topic

Table 3.2.2 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.2.2: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Statistics Topic Paper 2

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Questions 1 and 2 fully justified. However, the topic should not be in the same position every year, as this makes topic coverage predictable. This issue will be discussed in detail under 'item types.'

Recommendations to avoid unacceptable predictability on topic coverage
The DBE should consider the following to minimise predictability: • Statistics should not be in Questions 1 and 2 every year (order the topics differently annually) • Vary the difficulties and cognitive demands of subtopics every year
Identified unacceptable predictability on content coverage
There is no unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and the adherence indicates predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
The DBE should continue to ensure that the examination question papers cover Statistics and its subtopics as required by CAPS. However, there should be a variation of item types every year to reduce predictability.
Strategies to maintain content coverage that do not lead to a predictable question paper
None, since deviation from the required topic coverage would breach the CAPS.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 20 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
None, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
Track the topic weighting year-on-year.

Identified unacceptable predictability on item types
In Statistics, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Statistics items that are non-routine and require higher-order reasoning.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Track the item types used year on year.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates strong repetition of fixed topic–skill combinations. The subtopics and matching skills in Statistics remain relatively similar from year-to-year. Subtopics are in the same form and style, requiring the same set of skills and approach.
Recommendations to avoid unacceptable predictability through topic–skill pairing
Varying the item types used in the statistics topic will lead to assessment of varied skill set within the Statistics topic.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
Track the topic–skill pairing year-on-year.
Identified unacceptable predictability in the scenario framing of items
The contexts used in each question vary, meaning the wording of the scenarios differs across 2022–2024. However, the framing in relation to the structure and presentation remains constant. This makes the Statistics topic predictable.
Recommendations to avoid unacceptable predictability in scenario framing of items
DBE should ensure that items are structured and presented differently year-on-year.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Track the framing of items year-on-year.

Table 3.2.3 below summarises the analysis conducted to determine the level of predictability for the Analytical Geometry topic for DBE Mathematics Paper 2 examinations from 2022 to 2024.

Table 3.2.3: Findings on the Predictability of the Analytical Geometry Topic for the DBE Mathematics Paper 2 Examinations from 2022–2024

Topic: Analytical Geometry									
Year	**Topic Examined**	**Content/Topic(s) Covered & Marks**			**Weight per Topic**	**Item Type**	**Difficulty Level**	**Cognitive Demand**	**Skill Assessed**
2022	✓	3.1.1	Gradient	2	40	Procedural	1	1	Calculating the gradient
		3.1.2	Angle of Inclination	2		Procedural	1	2	Finding the angle of inclination
		3.1.3	Mid-point	2		Procedural	1	2	Calculating the mid-point
		3.1.4	y-intercept	2		Procedural	1	2	Finding the y-cut
		3.2	Equation of a line // to another	3		Procedural	1	2	Understanding the relation of m of // line and finding the equation of a line
		3.3.1	Angle formed by two lines	4		Procedural	2	2	Knowing and applying the angle formula correctly

		3.3.2	Area of a quad	5		Procedural	3	3	Ability to use coordinates of vertices to calculate area
		4.1	Mid-point	2		Procedural	1	2	Knowing and applying the mid-point formula correctly
		4.2.1	Circle with radius and centre	3		Procedural	2	2	Correct substitution into circle equation
		4.2.2	Perpendicular to a line	5		Procedural	2	2	Applying the perpendicular m condition
		4.3	Transformation of a tangent	4		Procedural	2	3	Knowing how to transform a line such that it touches the circle at two points
		4.4.1	Tangent	2		Procedural	3	3	Visualising the new tangent and using the distance formula
		4.4.2	Optimisation in Analytical Geo	4		Problem-solving	4	4	Optimisation
2023	✓	3.1	Distance between two points	2	40	Procedural	1	2	Using the distance formula
		3.2	Gradient	2		Procedural	1	1	Calculating the gradient

		3.3	Angle of Inclination	2		Procedural	1	2	Finding the angle of inclination
		3.4	Angle formed by two lines	3		Procedural	2	2	Relating the gradient to the angle
		3.5	Parallel to a line	3		Procedural	1	2	Finding the equation of parallel lines
		3.6	Area of a triangle	3		Procedural	2	2	Calculating the area of a triangle
		3.7	Circle Geo & Mid-point	3		Procedural	2	3	Using Eucl Geo in analytical Geo
		3.8	Circle Geo & Mid-point	2		Procedural	3	3	Using Eucl Geo in analytical Geo
		4.1	Circle with radius and centre	2		Procedural	1	1	Correct substitution into circle equation
		4.2	Mid-point	3		Procedural	2	2	Knowing and applying the mid-point formula correctly
		4.3	Tangent	4		Procedural	2	2	Finding the equation of a straight line having 2 points
		4.4	Perpendicular to a line	3		Procedural	2	2	Recognising circle properties and understanding perpendicularity
		4.5	Circle with radius and centre	4		Procedural	2	2	Correct substitution into circle equation

		4.6	Tangency	4		Problem-solving	3	4	Using the given condition to satisfy tangency
2024	✓	3.1	Gradient	2	39	Procedural	1	1	Using the gradient formula
		3.2	Line through two points	2		Procedural	1	1	Finding the equation of a straight line having 2 points
		3.3	Point on a line	1		Procedural	1	1	Substitution
		3.4	Distance between two points	2		Procedural	1	2	Using the distance formula
		3.5	Distance between two points & ratio	2		Procedural	1	2	Using the distance formula
		3.6	Proportionality Theorem	4		Procedural	2	2	Using the proportionality theorem
		3.7	Equation of a line, circle with radius & simultaneous equations	6		Procedural	3	3	Integration
		4.1	Mid-point	2		Procedural	1	2	Using the mid-point formula
		4.2	Tangent	4		Procedural	1	2	Understanding perpendicularity

		4.3	Circle with radius and centre	4		Procedural	1	2	Correct substitution into circle equation and expanding to general form
		4.4	Point on the circle	2		Procedural	1	2	Substitution
		4.5	Angle between two lines	5		Procedural	3	3	Relating the gradient to the angle
		4.6	Circle Geo & Analytical Geo	3		Procedural	3	3	Integration

Table 3.2.3 presents a comparative overview of the Analytical Geometry topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.2.3 have contributed to the predictability of the DBE Mathematics final examination Paper 2 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Analytical Geometry topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised into particular questions (e.g., Analytical Geometry is in Questions 3 and 4) in the examination question papers, as was the case during the period under review.

b. Content coverage

The CAPS requires that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of the subtopics in the examination question papers suggest a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics Curriculum and Mathematics SAGs prescribe that 40 marks of the total marks of the examination question papers should be allocated to Analytical Geometry, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Analytical Geometry has remained largely consistent across the three years, with each paper assigning 40 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 2 examinations indicate little to no variation in the item types used to assess Analytical Geometry subtopics. In all three years, the Analytical Geometry items are primarily procedural. This lack of variety in item type indicates predictability. Candidates can expect that most marks will be earned through routine algorithmic application rather than through complex reasoning, interpretation, explanation, and recall of mathematical facts. However, there are inconsistencies in difficulty levels (for example, Mid-point was set at easy in 2022, moderate in 2023, and easy in 2024), cognitive demand, and mark allocation, making this section of the work less predictable.

e. Topic and skill pairing

The analysis indicates that under Analytical Geometry the topic–skill combinations remain relatively similar over the three-year period.

There is a repetition of identical skill chains from year-to-year (for example, the direct calculation of length, gradient, mid-point, angle of inclination and the area of 'triangle,' etc.). The items are in the same form and style; this means the same skills and approaches are assessed. The underlying structure of the items remains relatively similar, allowing the candidates to demonstrate procedural fluency on items of equivalent difficulty. The change in the item types used in Analytical Geometry will alter topic–skill combinations and make the paper less predictable. The topic–skill combinations may be changed by moving from basic calculations to explaining why a method works, finding errors in solutions, justifying solutions, and comparing strategies. Moreover, this is done by framing the subtopics differently. The change in the item type will affect subtopic–skill combinations, the levels of cognitive demand and the difficulty of items, thereby reducing predictability.

f. Scenario framing of items for a topic

In Analytical Geometry, the structure and presentation remain constant across 2022–2024. Dominance of triangle use was observed, and items require the use of formulae (distance, gradient), calculation of the angle of inclination, and calculation of triangle areas. This implies that the items are procedural. Alternatively, other polygons may be used, and candidate may be required to demonstrate their understanding of the properties of those polygons in relation to the calculations made. In that way, they may demonstrate conceptual understanding rather than simple procedural fluency. The items related to circle Geometry vary significantly in structure and presentation. However, they tend to focus on assessing procedural fluency and are averaged at the moderate difficulty level. These trends make Analytical Geometry items predictable. Alternatively, more items (e.g., implying more marks) can be made difficult, thereby influencing the difficulty of this section and the whole examination paper. Setting one question (e.g., with a significant number of marks) that is not scaffolded and is a 'problem-solving' and 'difficult' item. This requires using an unfamiliar problem that affects the structure and presentation (e.g., framing of items) of a question relative to other papers.

Summary of findings and recommendations for the DBE Mathematics Analytical Geometry topic

Table 3.2.4 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.2.4: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Analytical Geometry Topic Paper 2

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Questions 3 and 4 fully justified. Analytical Geometry is a compulsory Paper 2 topic.
Recommendations to avoid unacceptable predictability on topic coverage
No avoidance is required. The DBE should ensure that this topic is covered as required by the CAPS each year.
Identified unacceptable predictability on content coverage
There is no unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics, the question papers covered them appropriately as required by the CAPS, and the adherence indicates predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
The DBE should continue to ensure that the examination question papers cover Analytical Geometry and its subtopics as required by CAPS.
Strategies to maintain content coverage that do not lead to a predictable question paper

Track the content coverage year on year.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 40 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
The DBE should continue to ensure that topic weighting remains around 40 marks, as required by CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
Track the topic weighting year-on-year.
Identified unacceptable predictability on item types
There is no unacceptable predictability. In all three years, the Analytical Geometry items were procedural. However, there were inconsistencies in levels of difficulty, cognitive demand, and mark allocation, making trigonometry less predictable.
Recommendations to avoid unacceptable predictability on item types
The DBE should design items that require candidates to explain, recall mathematical facts, compare or justify solutions, rather than merely calculate.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Track item types year on year to ensure items differ from those of previous years.
Identified unacceptable predictability on topic–skill pairing
No unacceptable predictability. However, the analysis indicates that under Analytical Geometry the topic–skill combinations remain relatively similar over the three-year period. There are one or two items that deviated from the trend, making topic–skill pairing less predictable.
Recommendations to avoid unacceptable predictability through topic–skill pairing

Framing the subtopics differently will affect the item type, resulting in different subtopic–skill combinations, different levels of cognitive demand, and greater item difficulty, thereby reducing predictability.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
The DBE should track the pairing of (sub)topic–skills to ensure that the papers do not focus on the same skills from year to year.
Identified unacceptable predictability in the scenario framing of items
In Analytical Geometry, the structure and presentation within the questions remain constant across 2022–2024. Dominance of triangle use was observed, and items required the use of formulae (distance, gradient), calculation of the angle of inclination, and calculation of the areas of the triangles. Implying that the items are procedural. The items related to circle Geometry vary significantly in structure and presentation, thus reducing the predictability.
Recommendations to avoid unacceptable predictability in scenario framing of items
Use different polygons each year. Provide items requiring candidates to demonstrate their understanding of the properties of those polygons in relation to the calculations made.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Track the framing of items year-on-year to ensure variation.

Table 3.2.5 summarises the analysis conducted to determine the level of predictability for the Trigonometry topic for DBE Mathematics Paper 2 examinations from 2022 to 2024.

Table 3.2.5: Findings on the Predictability of the Trigonometry Topic for the DBE Mathematics Paper 2 Examinations from 2022–2024

Topic: Trigonometry									
Year	**Topic Examined**	**Content/Topic(s) Covered & Marks**			**Weight per Topic**	**Item Type**	**Difficulty Level**	**Cognitive Demand**	**Skill Assessed**
2022	✓	5.1.1	Trig ratio	2	50	Procedural	ID	2	Working on Trig ratios
		5.1.2	Trig ratio	3		Procedural	ID	2	Working on Trig ratios
		5.1.3	Trig ratio	2		Procedural	ID	2	Working on Trig ratios
		5.2	Trig identities	5		Procedural	2	2	Solving Trig identities
		5.3	Trig equation	6		Procedural	2	2	Solving Trig equation
		5.4.1	Trig identities	4		Procedural	2	2	Proving Trig identities
		5.4.2	Trig identities	3		Procedural	2	2	Solving Trig identities
		5.5.1	Trig expression	4		Procedural	3	3	Simplifying Trig expression
		5.5.2	Trig ratio	1		Procedural	2	2	Optimisation
		6.1	Trig graph - period	1		Recall	1	1	Knowing the period of Trig graphs

		6.2.1	Trig graph - ordinate (y-value)	1		Recall	1	1	Substitution
		6.2.2	Trig graph - point of interception	1		Procedural	1	1	Working on Trig graphs
		6.3	Trig graph – range	2		Procedural	1	1	Effect of a on the range
		6.4	Trig graph	2		Procedural	2	3	Evaluating an inequality
		6.5	Trig identities and Trig graphs	3		Procedural	3	3	Recognising and applying Trig identities and graphical visualisation
		7.1	3D Trig	2		Procedural	1	2	Indicating the length as variable(s)
		7.2	3D Trig	5		Procedural	2	3	Extending Trig identities to 3D trig
		7.3	3D Trig	3		Procedural	2	2	Using the area rule
2023	✓	5.1.1	Trig ratio	3	50	Procedural	1	2	Working on Trig ratios
		5.1.2	Trig ratio	3		Procedural	1	2	Working on Trig ratios
		5.1.3	Trig ratio	3		Procedural	2	2	Working on Trig ratios
		5.2.1	Trig identities	4		Procedural	2	2	Proving Trig identities

		5.2.2	Trig identities	2		Recall	1	1	Knowing the denominator of a Trig identity equals zero, the expression is undefined
		5.2.3	Trig identities	2		Procedural	2	1	Graphical visualisation
		5.3.1	Compound angle identities	3		Procedural	2	2	Proving compound angle identities
		5.3.2	General solution	5		Procedural	3	3	Solving Trig equations
		5.4	Trig ratio	6		Procedural	3	3	Simplifying Trig expression
		6.1	Trig graph - period	1		Recall	1	1	Knowing the period of Trig graphs
		6.2	Trig graph – range	2		Recall	1	1	Knowing the range of Trig graphs
		6.3.1	Trig graphs	2		Procedural	1	3	Evaluating an inequality
		6.3.2	Trig graphs	2		Procedural	2	3	Evaluating an inequality
		6.4	Trig graphs	3		Procedural	3	3	Effect of a on the points on the graph
		6.5	Trig graph	2		Procedural	3	3	The effect of a translation
		7.1	3D Trig	2		Procedural	2	2	Indicating the length as variable(s)

		7.2	3D Trig	2		Procedural	3	2	Extending Trig identities to 3D trig
		7.3	3D Trig	3		Procedural	2	2	Solving 3D Trig problems
2024	✓	5.1.1	Trig ratio	2	50	Procedural	1	1	Working on Trig ratios
		5.1.2	Trig ratio	2		Procedural	1	2	Working on Trig ratios
		5.1.3	Trig ratio	4		Procedural	2	2	Working on Trig ratios
		5.2	Trig expression	4		Procedural	2	2	Solving Trig expressions
		6.1.1	Compound angle identities	2		Procedural	1	1	Deriving compound angle identities
		6.1.2	Compound angle identities	6		Procedural	2	2	Proving compound angle identities
		6.2	Trig equations	6		Procedural	3	3	Solving Trig equations
		6.3.1	Trig identities and Trig graphs	3		Problem-solving	4	4	Recognising and applying Trig identities and graphical visualisation

		6.3.2	Trig identities and Trig graphs	1		Problem-solving	4	4	Recognising and applying Trig identities and graphical visualisation
		7.1	Trig graph - asymptote	1		Recall	1	1	Knowing the asymptotes of tan graphs
		7.2	Trig graphs	2		Procedural	1	1	Evaluating an inequality
		7.3.1	Trig graph - period	1		Recall	1	1	Knowing the period of Trig graphs
		7.3.2	Trig graph	3		Procedural	2	2	Sketching a graph
		7.4	General solution	4		Procedural	2	3	Using the graph
		8.1	3D Trig	2		Procedural	1	2	Extending Trig identities to 3D Trig to calculate length
		8.2	3D Trig	7		Procedural	3	3	Solving 3D Trig problems

Table 3.2.5 presents a comparative overview of the Trigonometry topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.2.5 have contributed to the predictability of the DBE Mathematics final examination Paper 2 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Trigonometry topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a

predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised within a particular question (e.g., Trigonometry in Questions 5 and 8) in the examination question papers, as was the case during the period under review.

b. Content coverage

The CAPS requires that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of subtopics in examination question papers indicate a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 50 marks of the total marks of the examination question papers should be allocated to Trigonometry, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Trigonometry has remained largely consistent across the three years, with each paper assigning 50 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 2 examinations indicate little to no variation in the item types used to assess Trigonometry subtopics. In all three years, the Trigonometry items were primarily procedural. This lack of variety in item type indicates predictability. Candidates can expect that most marks will be earned through routine algorithmic application rather than through complex reasoning, interpretation, explanation, and recall of mathematical facts. In part, there were items that required higher-order reasoning, while the mark allocation was low, which made any significant change to the overall difficulty of a paper difficult. This pattern can be avoided by designing more items that require candidates to recall

mathematical facts and by increasing the number of items that require candidates to solve problems (e.g., set one problem-solving question that is not scaffolded and carries more marks to significantly affect the paper's difficulty). This practice should be rotated across topics from year to year.

e. Topic and skill pairing

The analysis indicates that under Trigonometry the topic–skill combinations remain relatively similar over the three-year period. The items are in the same form and style; this means the same skills and approaches are assessed. The underlying structure of the items remains relatively similar, allowing the candidates to demonstrate procedural fluency on items of equivalent difficulty. The change in the item types used in Trigonometry will alter topic–skill combinations and make the paper less predictable. The topic–skill combinations may be changed by moving from simply working on 'Trigonometry ratios' to explaining why a method works, finding errors in solutions, justifying solutions, and comparing strategies. The change in the item types will affect the levels of cognitive demand and the difficulty of items.

f. Scenario framing of items for a topic

In Mathematics, item framing focuses on how items are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed indicate that the framing of Trigonometry items across 2022–2024 reflects both consistency in structure and presentation and a focus mainly on procedural fluency. The framing lacks items that promote strategic thinking and allow candidates to solve problems. This practice renders the examination question papers predictable, which can be avoided by ensuring that the topics include non-routine items that require higher-order thinking. The inclusion of non-routine items will affect the framing of the topic year on year.

Summary of findings and recommendations for the DBE Mathematics Trigonometry topic

Table 3.2.6 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.2.6: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Trigonometry Topic Paper 2

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Questions 5 to 8 fully justified. However, the items are ordered the same way every year, making this section predictable.
Recommendations to avoid unacceptable predictability on topic coverage
No avoidance is required since predictability is acceptable. However, varying the topic each year would reduce predictability, since the examination question paper is ordered from easiest to most challenging.
Identified unacceptable predictability on content coverage
There is no unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and this adherence indicates some predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage

The DBE should continue to ensure that the examination question papers cover Trigonometry and its subtopics as required by CAPS. However, there should be a variation of item types every year to reduce predictability.
Strategies to maintain content coverage that do not lead to a predictable question paper
Track content coverage year-on-year and ensure compliance with the CAPS.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 50 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
None, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
Track topic weighting year-on-year and ensure compliance with the CAPS.
Identified unacceptable predictability on item types
There is no unacceptable predictability. However, across all three years, the Trigonometry items were primarily procedural. This lack of variety in item type indicates predictability that is not necessarily unacceptable. The nature of items in the papers is highly specialised to minimise ambiguity.
Recommendations to avoid unacceptable predictability on item types
No avoidance is required. However, items that require remembering mathematical facts and problem-solving may be included to minimise predictability and balance the papers. This practice may be rotated across topics from year-to-year.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Track the item types year on year to ensure that items differ from those of previous years.
Identified unacceptable predictability on topic–skill pairing

There is no unacceptable predictability. However, the analysis indicates that under Trigonometry, the topic–skill combinations remain relatively similar over the three-year period. The items are in the same form and style; this means the same skills and approaches are assessed. The underlying structure of the items remains relatively similar, allowing the candidates to demonstrate procedural fluency on items of equivalent difficulty.
Recommendations to avoid unacceptable predictability through topic–skill pairing
No avoidance is required. However, limit the repetition of identical skill chains from year-to-year. Develop topic–skill matrices that encourage a greater variety of skills throughout the examination question papers, rather than relying on the same small set of routine procedures.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
Track the topic–skill combinations year on year to ensure that skills differ from those of previous years.
Identified unacceptable predictability in the scenario framing of items
The patterns observed indicate that the framing of Trigonometry items across 2022–2024 reflects both consistency in structure and presentation and a focus mainly on procedural fluency. The framing is free of items that promote strategic thinking and allow candidates to solve problems.
Recommendations to avoid unacceptable predictability in scenario framing of items
DBE should ensure that the topic has items that are non-routine and require higher-order thinking. The inclusion of non-routine items will affect the framing of the topic year on year.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Track the framing of items year-on-year to ensure variation.

Table 3.2.7 below summarises the analysis conducted to determine the level of predictability for the Euclidean Geometry topic for DBE Mathematics Paper 2 examinations from 2022 to 2024.

Table 3.2.7: Findings on the Predictability of the Euclidean Geometry Topic for the DBE Mathematics Paper 2 Examinations from 2022–2024

Topic: Euclidean Geometry									
Year	**Topic Examined**	**Content/Topic(s) Covered & Marks**			**Weight per Topic**	**Item Type**	**Difficulty Level**	**Cognitive Demand**	**Skill Assessed**
2022	✓	8.1.1	Circle Geometry	2	40	Recall	1	1	Using circle geo to find the size of angles
		8.1.2	Circle Geometry	2		Recall	1	1	Using circle geo to find the size of angles
		8.1.3	Circle Geometry	2		Recall	1	1	Using circle geo to find size of angles
		8.2.1	Mid-point Theorem	1		Recall	1	1	Knowing the mid-point theorem
		8.2.2	Mid-point Theorem	6		Procedural	3	3	Applying the mid-point & proportionality theorem
		9.1	Circle Geometry	5		Procedural	2	2	Proving a theorem
		9.2.1	Circle Geometry	5		Procedural	3	3	Proving a cyclic quad

		9.2.2	Circle Geometry	4		Procedural	2	2	Using Geo theorems to prove equal angles
		10.1	Circle Geometry	4		Procedural	2	2	Using Geo theorems to prove equal angles
		10.2	Similar triangles Geometry	5		Procedural	3	3	Proving triangles similarity
		10.3	Proportionality	4		Problem-solving	4	4	Working with ratios and proportions from similar triangles
2023	✓	8.1	Circle Geometry	5	40	Procedural	2	2	Proving a theorem
		8.2	Circle Geometry	5		Procedural	1	2	Working out the size of angles
		8.3.1	Circle Geometry	2		Recall	1	1	Knowing angle properties
		8.3.2	Circle Geometry	4		Procedural	2	2	Using circle geo to solve
		9.1	Proportionality	3		Procedural	1	2	Using the prop theorem
		9.2	Proportionality	3		Procedural	2	2	Proving similar triangles
		9.3	Proportionality	3		Procedural	2	2	Using similar triangles to find length of side(s)
		10.1	Circle Geometry	5		Procedural	3	3	Solving riders

		10.2	Circle Geometry	4		Procedural	3	3	Solving riders
		10.3	Circle Geometry	6		Procedural	4	4	Solving riders
2024	✓	9.1	Circle Geometry	2	41	procedural	1	1	Working on a cyclic quad
		9.2	Circle Geometry	4		Procedural	2	2	Working on a cyclic quad
		10.1	Proportionality	6		Procedural	2	2	Proving a theorem
		10.2.1	Proportionality	5		Procedural	2	2	Applying the proportionality theorem
		10.2.2	Proportionality	4		Procedural	2	2	Applying the proportionality theorem
		11.1	Similar triangle Geometry	6		Procedural	2	2	Identifying equal angles using circle geo theorems
		11.2	Similar triangle Geometry	4		Procedural	2	2	Using the prop theorem
		11.3	Similar triangle Geometry	4		Procedural	2	2	Proving triangles similarity
		11.4	Similar triangle Geometry	6		Problem-solving	4	4	Working with ratios and proportions

Table 3.2.7 presents a comparative overview of the Euclidean Geometry topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.2.7 have contributed to the predictability of the DBE Mathematics final examination Paper 2 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Euclidean Geometry topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic is compartmentalised in a particular question (e.g., Euclidean Geometry is in Questions 9 to 11) of the examination question papers, as was the case during the period under review.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of subtopics in examination question papers indicate a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The CAPS Mathematics prescribes that 40 marks of the total marks of the examination question papers should be allocated to Euclidean Geometry, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Euclidean Geometry has remained largely consistent across the three years, with each paper assigning 40 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The analysis indicates that under Euclidean Geometry, the item types differ over the three-year period. Euclidean Geometry offers a variety of recall, procedural, and problem-solving items, and candidates are expected to justify the solutions. This is because each Euclidean Geometry question is unique, as it is based on specific diagrams, theorems, and solution approaches, making the topic unpredictable. The context of a Euclidean Geometry problem changes the reasoning and solution path; thus, different items need specific skills. This makes the Euclidean Geometry topic unpredictable. However, candidates can expect the Euclidean Geometry items to vary in difficulty, ranging from easy recall to moderate procedural and, finally, challenging problem-solving items.

e. Topic and skill pairing

The analysis indicates that under Euclidean Geometry, the topic–skill combinations differ over the three-year period. This is because different subtopics are tested every year in Euclidean Geometry. Each Euclidean Geometry question is unique; the subtopics/items rely on a specific diagram, theorem and approach to a solution, making this topic unpredictable. The context of a Euclidean Geometry problem changes the reasoning and solution path; thus, different items need specific skills. This makes the Euclidean Geometry topic unpredictable.

f. Scenario framing of items for a topic

The analysis indicates that under Euclidean Geometry, the framing differs over the three-year period. This is because each Euclidean Geometry question is unique, as items are based on specific diagrams, theorems, and solution approaches, making the topic unpredictable. The context of a Euclidean Geometry problem changes the reasoning and solution path; thus, different items need specific skills. This makes Euclidean Geometry unpredictable. However, candidates can expect the Euclidean Geometry items to be of moderate difficulty.

Summary of findings and recommendations for the DBE Mathematics Euclidean Geometry topic

Table 3.2.8 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.2.8: Summary of Findings and Recommendations on the Predictability of the 2022–2024 DBE Mathematics Euclidean Geometry Topic Paper 2

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Questions 9 to 11 fully justified. However, the items are ordered the same way every year, making this section predictable. This issue will be discussed in detail under 'item' types.
Recommendations to avoid unacceptable predictability on topic coverage
No avoidance is required.
Identified unacceptable predictability on content coverage
There is no unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and the adherence indicates some predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
The DBE should continue to ensure that the examination question papers cover Trigonometry and its subtopics as required by CAPS.

Strategies to maintain content coverage that do not lead to a predictable question paper
Track content coverage year-on-year and ensure compliance with the CAPS.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 40 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
There is none, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
Track topic weighting year-on-year and ensure compliance with the CAPS.
Identified unacceptable predictability on item types
No unacceptable predictability. Euclidean Geometry offers a variety of recall, procedural, and problem-solving items, and candidates are expected to justify the solutions.
Recommendations to avoid unacceptable predictability on item types
No avoidance is required. However, the DBE may consider designing Euclidean Geometry items that require candidates to explain and/or justify solutions.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Track the item types year on year to ensure that items differ from those of previous years and are kept balanced.
Identified unacceptable predictability on topic–skill pairing
There is no unacceptable predictability. The analysis indicates that under Euclidean Geometry, the topic–skill combinations differ over the three-year period.
Recommendations to avoid unacceptable predictability through topic–skill pairing

No avoidance is required.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
Track the topic–skill combinations year on year to ensure that skills differ and are maintained in parts in accordance with the item types in the papers.
Identified unacceptable predictability in the scenario framing of items
There is no unacceptable predictability. The analysis indicates that under Euclidean Geometry, the framing differs over the three-year period. This is because each Euclidean Geometry question is unique. Items are based on specific diagrams, theorems, and solution approaches, making this topic unpredictable.
Recommendations to avoid unacceptable predictability in scenario framing of items
No avoidance is required.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Track the framing of items year-on-year to ensure variation.

Conclusions

Based on the evaluation of the 2022–2024 DBE Mathematics Paper 2 final examinations, the question papers demonstrate strong predictability in topic coverage, content coverage, topic weighting, item types, and topic–skill pairing. While topic coverage, content coverage, and topic weighting are a curriculum requirement, item types and topic–skill pairing are assessment flaws. Firstly, the CAPS asserts that 20% of items should be knowledge (recall) and 15% problem-solving; the analysis indicates that the paper was lacking in those two item types year on year. Secondly, the CAPS asserts that "questions will not necessarily be compartmentalised in section." However, topics are mostly grouped by question in the evaluated question papers. These two factors result in very predictable examination question papers.

Setting an examination question paper is a balancing act. In practice, a balance in the difficulty levels, cognitive demands, question/item types, mark allocation, content coverage, and skills assessed is often disrupted; a significant change in one element affects the others, thereby introducing unpredictability. In Mathematics, a significant change in the items is often achieved by adjusting the difficulty and cognitive demand of item types; this implies changing the item types. Accordingly, any significant changes to questions/items affect the fairness, comprehensiveness, and how candidates engage with the examination question paper. Although the DBE Paper 2 indicates predictability, this is not necessarily unacceptable, as all parts comply with the CAPS and the paper is based on a strong classification of Mathematics free of real-life context-based problems; thus, the examination papers are primarily procedural. This is expected since CAPS requires approximately 65% of the examination question papers to be procedural.

3.3: MATHEMATICS PAPER 1

This section presents an analysis of the IEB final examination question papers from 2022 to 2024 for Mathematics Paper 1 topics. The findings for each topic are summarised in Tables 3.3.1–3.3.12.

Table 3.3.1 below summarises the analysis conducted to determine the level of predictability for the Algebra topic for IEB Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.3.1: Findings on the Predictability of the Algebra Topic for the IEB Mathematics Paper 1 Examinations from 2022–2024

Topic: Algebra									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	1a1	Quadratic equations – solving from factorised form	2	25	Procedural	1	1	Solving equations
		1a2	Exponential equations – unknown in exponent	2		Procedural	1	1	Solving exponents
		1a3	Quadratic inequalities in one variable	4		Procedural	2	2	Solving inequalities

		b1	Nature of roots – discriminant and equal/real roots	4		Procedural	2	2	Understanding the nature of roots
		2a	Exponential equations – base 3, linear exponent	2		Procedural	1	2	Solving exponents
		2b	Logarithmic equations – laws of logs	4		Procedural	2	2	Solving log equations
		2c1	Surds and radicals – domain/non-real values	2		Procedural	2	1	Working on surds and radicals
		2c2	Equations involving surds – substitution and solving	5		Procedural	2	2	Working on surds
2023	✓	1a1	Exponential equations – solve for x and express answer in logarithmic form	1	24	Procedural	1	1	Solving exponents
		1a2	Quadratic equations – solve trinomial equation in standard form	4		Procedural	2	2	Solving equations
		1b	Simultaneous equations – solve non-linear system in x and y	5		Procedural	2	2	Solving equations

		1c	Inequalities – solve rational/Algebraic inequality in one variable	4		Procedural	2	2	Solving inequalities
		7a	Algebraic manipulation – compare coefficients to find unknown parameters in identity	3		Procedural	1	2	Algebraic manipulation
		7b1	Exponent laws	1		Procedural	1	1	Use exponent laws
		7b2	Exponent laws	1		Procedural	1	1	Use exponent laws
		7b3	Exponent laws	1		Procedural	1	1	Use exponent laws
		7c	Logarithmic equations	4		Procedural	2	2	Solving log equations
2024	✓	1a1	Quadratic equations	2	27	Procedural	2	1	Solving equations
		1a2	Quadratic equations – solve using the quadratic formula	4		Procedural	2	1	Solving equations
		1a3	Quadratic inequalities	3		Procedural	2	2	Solving inequalities

		1b	Nature of roots – determine k for equal roots using discriminant	4		Procedural	2	2	Understanding the nature of roots
		2a	Exponential equations	3		Procedural	2	2	Solving exponential equations
		2b	Exponential equations – solve equation with variable in exponent on both sides	5		Procedural	2	2	Solving exponential equations
		2c1	Logarithms	2		Procedural	1	1	Evaluating logs
		2c2	Logarithms	2		Procedural	1	1	Evaluating logs
		2c3	Logarithms	2		Procedural	1	1	Evaluating logs

Table 3.3.1 presents a comparative overview of the Algebra topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.3.1 have contributed to the predictability of the IEB Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Algebra topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic and its subtopics are not necessarily compartmentalised into sections or questions

in examination question papers from year to year. The decompartmentalised arrangement of questions renders the whole examination paper unpredictable, since the topic arrangement cannot be easily determined from past examination papers. The topics are rotated within sections and questions yearly; this rotation affects the difficulty and cognitive demands of items, minimising reliance on past papers and reducing predictability.

b. Content coverage

The CAPS requires that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined yearly, but not necessarily under the same topics. In parts where a subtopic is not tested under its assigned topic, it emerges from integrating or modelling various topics. The varying arrangement of subtopics in examination question papers indicates unpredictability.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 25 marks of the total marks of the examination question papers should be allocated to Algebra, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Algebra has remained largely consistent across the three years, with each paper assigning 25 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Algebra subtopics; the same item types are used over the years. In all three years, the Algebra items are procedural. This lack of variety in item type contributes to high predictability: candidates can expect that most marks will be earned through routine algorithmic application rather than explaining and recalling mathematical facts. This pattern

can be avoided by designing items that require candidates to explain, recall mathematical facts, compare or justify, rather than merely calculate, thereby broadening the evidence of conceptual understanding. On the other hand, the evaluation indicates that the levels of difficulty, cognitive levels, and the mark allocation for the items vary considerably across topics, due to the integration of topics, modelling and the significant number of problem-solving items. Overall, the examination question papers have different tones each year, which may be disturbing for candidates and make them fairly unpredictable.

e. Topic and skill pairing

The analysis indicates that the topic–skill combinations remain relatively similar for parts that consist of 'traditional' Mathematics items, such as 'solving equations.' In other parts of the examination question papers, the topic–skill combinations are not aligned with those of previous years. This is due, first, to the unconventional integration of topics or alternative skill combinations (for example, under Algebra, 'simultaneous equations' was assessed, but not functions). Secondly, some topics are distributed across different sections of the paper, meaning that in one year some subtopics may be easy (e.g., in Section A) and in another year the same subtopics may be challenging (e.g., in Section B). Under conventional integrated topics, items are not scaffolded, and their framing differs significantly. In principle, the underlying structure of items within any topic may be altered; increasing or decreasing item difficulty directly influences the topic–skill pairing. For those reasons, the topic–skill pair can be considered unpredictable.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items across 2022–2024 reflects both consistency in structure and presentation for 'traditional' Mathematics items and inconsistency when integration is involved, thus explaining fluctuations in the difficulty of subtopics/items. The framing is free of conceptual items (except

in parts where such items are expected) but includes enough application items (in parts where such items are not expected). This practice renders the items in the examination question papers unpredictable.

Summary of findings and recommendations for the IEB Mathematics Algebra topic

Table 3.3.2 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.3.2: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Algebra Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in examination question papers fully justified.
Recommendations to avoid unacceptable predictability on topic coverage
No avoidance is required.
Identified unacceptable predictability on content coverage
There is no unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and the adherence indicates predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage

No avoidance is required.
Strategies to maintain content coverage that do not lead to a predictable question paper
No strategy is required.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 25 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
There is none, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
No strategy is required.
Identified unacceptable predictability on item types
In Algebra, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Algebra items that require candidates to explain, interpret, compare or justify solutions, not only calculations.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Set item-type targets at the examination construction stage and oversee adherence throughout moderation.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates weak repetition of fixed topic–skill combinations.
Recommendations to avoid unacceptable predictability through topic–skill pairing

No avoidance is required.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
No strategy is required.
Identified unacceptable predictability in the scenario framing of items
The observed patterns indicate that the framing of Algebra items across 2022–2024 reflects both inconsistencies in structure and in presentation.
Recommendations to avoid unacceptable predictability in scenario framing of items
No avoidance is required.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
No strategy is required.

Table 3.3.3 summarises the analysis conducted to determine the level of predictability for the Patterns and Sequences topic for IEB Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.3.3: Findings on the Predictability of the Patterns and Sequences Topic for the IEB Mathematics Paper 1 Examinations from 2022–2024

Topic: Patterns and Sequences									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	4a1	Arithmetic sequences – general term/solve for n	2	23	Procedural Task	1	1	Working on an arithmetic series

		4a2	Arithmetic series – sum of n terms	3		Procedural Task	1	2	Working on an arithmetic sequence
		4b	Geometric series – using Sn to find term	4		Procedural Task	2	2	Working on a geometric series
		8a	Sigma notation – arithmetic series	6		Procedural Task	2	2	Evaluating sigma notation
		8b1	Geometric series – context problem	3		Procedural Task	2	2	Working on a geometric series
		8b2	Quadratic modelling – maximum height	5		Problem-solving	3	4	Modelling
2023	✓	5a	Arithmetic sequences – determine number of terms from last term	3	27	Procedural Task	1	2	Working on an arithmetic sequence
		5b	Arithmetic series – express sum in sigma notation	2		Procedural Task	1	2	Writing in sigma notation
		5c	Arithmetic series – minimum number of terms for sum to exceed a given value	5		Procedural Task	2	3	Calculating sum of arithmetic sequence

		10a1	Geometric sequences – determine general term and rate for increasing flow	2		Procedural Task	1	2	Calculating geometric sequence
		10a2	Geometric series – sum of terms to model total quantity over time	3		Procedural Task	2	2	Working on a geometric series
		10b	Quadratic sequences – determine general term from given finite difference information	5		Procedural Task	2	3	Working on a quadratic pattern
		10c	Infinite geometric series – determine first term given sum to infinity and common ratio	3		Procedural Task	2	2	Infinite geometric series
		10d	Geometric sequences	4		Procedural Task	3	3	Working on geometric sequence
2024	✓	4a	Arithmetic sequence	4	27	Procedural Task	2	1	Working on an arithmetic series
		4b	Arithmetic sequence	2		Procedural Task	2	1	Working on an arithmetic series

		7a	Quadratic sequence – determine general nth term from first five terms	4		Procedural Task	2	2	Working on a quadratic pattern
		7b	Quadratic sequence – test whether a given value is a term of the sequence	4		Procedural Task	2	2	Working on a quadratic pattern
		8a1	Infinite geometric series – write first three terms from sigma notation	2		Procedural Task	2	1	Understanding of the Sigma notation
		8a2	Infinite geometric series – determine values of x for which the series converges	3		Procedural Task	2	2	Infinite geometric series
		8a3	Infinite geometric series – find sum to infinity in terms of x	3		Procedural Task	2	2	Infinite geometric series
		8b2	Geometric sequence of circle radii	5		Procedural Task	4	2	Working on geometric sequence

Table 3.3.3 presents a comparative overview of the Patterns and Sequences topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.3.3 have contributed to the predictability of the IEB Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Patterns and Sequences topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic and its subtopics are not necessarily compartmentalised in sections or questions in examination question papers from year to year. The decompartmentalised arrangement of questions renders the whole examination paper unpredictable, since the topic arrangement cannot be easily determined from past examination papers. The topics are rotated within sections and questions yearly; this rotation affects the difficulty and cognitive demands of items, minimising reliance on past papers and reducing predictability.

b. Content coverage

The CAPS requires that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined yearly, but not necessarily under the same topics. In parts where a subtopic is not tested under its assigned topic, it emerges from the integration or modelling of various topics. The varying arrangement of subtopics in examination question papers indicates unpredictability.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 25 marks of the total marks of the examination question papers should be allocated to Patterns and Sequences, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three

years. The mark allocation for Patterns and Sequences has remained largely consistent across the three years, with each paper assigning 25 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Patterns and Sequences subtopics; the same item types are used over the years. In all three years, the Patterns and Sequences of items are procedural. This lack of variety in item type contributes to high predictability: candidates can expect that most marks will be earned through routine algorithmic application rather than explaining and recalling mathematical facts. This pattern can be avoided by designing items that require candidates to explain, recall mathematical facts, compare or justify, rather than merely calculate, thereby broadening the evidence of conceptual understanding. On the other hand, the evaluation indicates that the levels of difficulty, cognitive levels, and the mark allocation for the items are varied considerably across the topic, through integration of topics, modelling and a significant number of problem-solving items. Overall, the examination question papers have different tones each year. This may be disturbing for candidates, making the examination question papers fairly unpredictable.

e. Topic and skill pairing

The analysis indicates that the topic–skill combinations remain relatively similar for parts that consist of 'traditional' Mathematics items, such as 'determining the general term of a quadratic pattern.' In other parts of the examination question papers, the topic–skill combinations are not aligned with those of previous years. This is due, first, to the unconventional integration of topics or alternative skill combinations (for example, Question 8 of 2023 and 2024, which required a combination of Functions and Patterns and thus different skill sets). Secondly, some topics are distributed across different sections of the paper, meaning that in one year some subtopics may be easy (e.g., in Section A) and in another year the same subtopics may be challenging (e.g., in Section B). Under

conventional integrated topics, the items are not scaffolded, and their framing differs significantly. In principle, the underlying structure of items within any topic may be altered, and topics may be integrated; increasing or decreasing item difficulty directly influences the topic–skill pairing. For those reasons, the topic–skill pair can be considered unpredictable.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items across 2022–2024 reflects both consistency in structure and presentation for 'traditional' Mathematics items and inconsistency where integration is involved, thus accounting for the fluctuations in the difficulty of subtopics/items. The framing is free of conceptual items (except in parts where such items are expected) but includes enough application items (in parts where such items are not expected). This practice renders the items in the examination question papers unpredictable.

Summary of findings and recommendations for the IEB Mathematics Patterns and Sequences topic

Table 3.3.4 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.3.4: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Patterns and Sequences Topic Paper 1

Identified unacceptable predictability on topic coverage

There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in examination question papers fully justified.
Recommendations to avoid unacceptable predictability on topic coverage
No avoidance is required.
Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and this adherence indicates some predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
No avoidance is required.
Strategies to maintain content coverage that do not lead to a predictable question paper
No strategy is required.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 25 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
There is none, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
No strategy is required.
Identified unacceptable predictability on item types

In Patterns and Sequences, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design pattern items that require candidates to explain, interpret, compare or justify solutions, not only calculations.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Set item-type targets at the examination construction stage and oversee adherence throughout moderation.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates weak repetition of fixed topic–skill combinations.
Recommendations to avoid unacceptable predictability through topic–skill pairing
No avoidance is required.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
No strategy is required.
Identified unacceptable predictability in the scenario framing of items
The patterns observed indicate that the framing of pattern items across 2022–2024 reflects inconsistencies in both structure and presentation.
Recommendations to avoid unacceptable predictability in scenario framing of items
No avoidance is required.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
No strategy is required.

Table 3.3.5 below summarises the analysis conducted to determine the level of predictability for the Functions and Graphs topic for IEB Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.3.5: Findings on the Predictability of the Functions and Graphs Topic for the IEB Mathematics Paper 1 Examinations from 2022–2024

Topic: Functions and Graphs									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	9a1	Hyperbolic functions	6	35	Procedural	2	3	Evaluation parameters of a hyperbola
		9a2	Hyperbolic functions	7		Procedural	3	3	Working on a hyperbola
		9b1	Inverse functions	3		Procedural	2	2	Logarithmic function – sketch
		9b2	Inverse functions	3		Procedural	2	2	Inverse functions – sketch
		9b3	Inverse functions	2		Procedural	2	1	Domain/range under inversion
		9b4	Combination of functions	1		Procedural	4	4	Interpreting inequalities via graphs

		11a	Combination of functions	7		Procedural	3	3	Coordinates/lengths from intersection
		11b	Combination of functions	6		Procedural	3	3	Comparing linear and quadratic functions
2023	✓	3a	Inverse functions	2	34	Procedural	1	2	Determining base from a point on the graph
		3b	Inverse functions	4		Procedural	1	2	Determining x- and y-intercepts
		3c	Combination of functions	2		Procedural	2	1	Interpreting inequalities via graphs
		3d	Inverse functions	4		Procedural	2	2	Sketching Inverse functions
		8a	Hyperbolic functions	1		Recall	1	1	Working on a hyperbola
		8b	Combination of functions	3		Procedural	1	2	Working on hyperbola and straight line

		8c	Analytical Geometry with functions	8		Procedural	2	3	Determining the area of a polygon formed within a sketch graph
		9a	Parabolic functions	4		Procedural	2	3	Determining parameters of a parabola
		9b	Parabolic functions	6		Problem-solving	4	4	Modelling within Parabolic functions
2024	✓	8a4	Function and Patterns	3	33	Procedural	3	3	Working on/with integrated topics
		8b1	Quadratic function and Patterns	2		Procedural	2	1	Working on/with integrated topics
		9a1	Hyperbolic functions	1		Recall	1	1	Stating domain of hyperbola
		9a2	Quadratic functions	3		Procedural	2	3	Understanding the parameters of a quadratic function

		9a3	Parabola and hyperbola functions	6		Procedural	2	2	Determining lengths between two functions
		9a4	Parabola and hyperbola functions	4		Procedural	3	3	Interpreting inequalities using functions
		9b	Inverse functions	5		Procedural	3	3	Working on inverse functions
		10a	Quadratic and linear functions	5		Procedural	2	2	Working across concepts/subtopics
		10b	Quadratic and linear functions	4		Procedural	2	3	Working across concepts/subtopics

Table 3.3.5 presents a comparative overview of the Functions and Graphs topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.3.5 have contributed to the predictability of the IEB Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Functions and Graphs topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates

a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic and its subtopics are not necessarily compartmentalised into sections or questions in examination question papers from year to year. The decompartmentalised arrangement of questions renders the whole examination paper unpredictable, since the topic order arrangement cannot be easily determined from past examination question papers. The topics are rotated within sections and questions yearly; this rotation affects the difficulty and cognitive demands of items, minimising reliance on past papers and reducing predictability.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined yearly, but not necessarily under the same topics. In parts where a subtopic is not tested under its assigned topic, it emerges from the integration or modelling of various topics. The varying arrangement of subtopics in examination question papers indicates unpredictability.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 35 marks of the total marks of the examination question papers should be allocated to Functions, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Functions has remained largely consistent across the three years, with each paper assigning 35 ±3 marks. This consistency reflects predictability, which is supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Functions subtopics; the same item types are used over the years. In all three years, the

Functions items are procedural. This lack of variety in item type contributes to high predictability: candidates can expect that most marks will be earned through routine algorithmic application rather than explaining and recalling mathematical facts. This pattern can be avoided by designing items that require candidates to explain, recall mathematical facts, compare or justify, rather than merely calculate, thereby broadening the evidence of conceptual understanding. On the other hand, the evaluation indicates that the levels of difficulty, cognitive levels, and the allocation of marks for the items vary considerably across topics due to the integration of topics, modelling, and a significant number of problem-solving items. Overall, the examination question papers have different tones each year. This may be disturbing for candidates, making the examination question papers fairly unpredictable.

e. Topic and skill pairing

The analysis indicates that the topic–skill combinations remain relatively similar for parts that consist of 'traditional' Mathematics items, such as 'drawing a graph.' In other parts of the examination question papers, the topic–skill combinations are not aligned with those of previous years. This is due, first, to the unconventional integration of topics or alternative skill combinations (for example, Question 8 of 2023 and 2024, which required a combination of Functions and Patterns and thus different skill sets). Secondly, some topics are distributed across different sections of the paper, meaning that in one year some subtopics may be easy (e.g., in Section A) and in another year the same subtopics may be challenging (e.g., in Section B). Under conventional integrated topics, the items are not scaffolded, and their framing differs significantly. In principle, the underlying structure of items within any topic may be altered, and topics may be integrated; increasing or decreasing item difficulty directly influences the topic–skill pairing. For those reasons, the topic–skill pair can be considered unpredictable.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items

across 2022–2024 reflects both consistency in structure and presentation for 'traditional' Mathematics items and inconsistency when integration is involved, resulting in fluctuations in the difficulty of subtopics/items. The framing is free of conceptual items (except in parts where such items are expected) but has enough application items (in parts where such items are not expected). This practice renders the items in the examination question papers unpredictable.

Summary of findings and recommendations for the IEB Mathematics Functions and Graphs topic

Table 3.3.6 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.3.6: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Functions and Graphs Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in examination question papers fully justified.
Recommendations to avoid unacceptable predictability on topic coverage
No avoidance required.
Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics;

the question papers covered them appropriately as required by the CAPS, and the adherence indicates predictability, which is mandatory but not unacceptable.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 35 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
None, since deviation from the required weighting would breach the CAPS.
Identified unacceptable predictability on item types
In Functions, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design function items that require candidates to explain, interpret, compare or justify solutions, not only calculations.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Set item-type targets at the examination construction stage and oversee adherence throughout moderation.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates weak repetition of fixed topic–skill combinations.
Identified unacceptable predictability in the scenario framing of items
The patterns observed indicate that the framing of functions items across 2022–2024 reflects inconsistencies in both structure and presentation.

Table 3.3.7 below summarises the analysis conducted to determine the level of predictability for the Finance topic for IEB Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.3.7: Findings on the Predictability of the Finance Topic for the IEB Mathematics Paper 1 Examinations from 2022–2024

Topic: Finance									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	6a	Compound interest	2	17	Procedural Task	1	2	Using the compound interest formula
		6b	Reducing-balance depreciation	2		Procedural Task	1	2	Using the reducing-balance depreciation formula
		6c	Future value of annuities	5		Procedural Task	2	2	Working on sinking fund –
		7a	Present value of annuities	3		Procedural Task	2	2	Using the PV annuity formula
		7b	Present value of annuities	5		Procedural Task	2	2	Calculating outstanding balance

2023	✓	6a	Mixed annuities and lump sums	7	15	Procedural Task	3	2	Working with various annuities
		6b1	Present value of annuities	3		Procedural Task	2	2	Calculating equal monthly repayment over fixed term
		6b2	Present value of annuities	5		Procedural Task	3	2	Determine number of payments for given monthly instalment (deferred annuity)
2024	✓	6a	Effective interest	3	12	Procedural Task	2	2	Using the effective interest formula
		6b1	Present value of annuities	4		Procedural Task	2	2	Calculating monthly instalment for home loan
		6b2	Present value of annuities	5		Procedural Task	2	2	Determining outstanding balance after specified number of years

Table 3.3.7 presents a comparative overview of the Finance topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.3.7 have contributed to the predictability of the IEB Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Finance topic consistently appears across all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS

mandate. The findings also indicate that the topic and its subtopics are not necessarily compartmentalised into sections or questions in examination question papers from year to year. The decompartmentalised arrangement of questions renders the whole examination paper unpredictable since the topic order cannot be easily determined from past examination papers. The topics are rotated within sections and questions yearly; this rotation affects the difficulty and cognitive demands of items, minimising reliance on past papers and reducing predictability.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined yearly, but not necessarily under the same topics. In parts where a subtopic is not tested under its assigned topic, it emerges from integrating or modelling various topics. The varying arrangement of the subtopics in examination question papers indicates unpredictability.

c. Weighting of the topic

The DBE CAPS Mathematics Curriculum (DBE, 2011, p. 55) and Assessment Policy Statement (DBE, 2021, p. 4) prescribe that 15 marks of the total marks of the examination question papers should be allocated to Finance, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Finance has remained largely consistent across the three years, with each paper assigning 15 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Finance subtopics; the same item types are used over the years. In all three years, the

Finance items are procedural. This lack of variety in item type contributes to high predictability: candidates can expect that most marks will be earned through routine algorithmic application rather than explaining and recalling mathematical facts. This pattern can be avoided by designing items that require candidates to explain, recall mathematical facts, compare or justify, rather than merely calculate, thereby broadening the evidence of conceptual understanding. On the other hand, the evaluation indicates that the levels of difficulty and the mark allocation for the items are varied considerably across the topic. Overall, the examination question papers have different tones each year. This may be disturbing for candidates, making the examination question papers fairly unpredictable.

e. Topic and skill pairing

The analysis indicates that under Finance, the topic–skill combinations remain relatively similar for parts that consist of 'traditional' Mathematics items, such as 'calculating an interest rate or using a formula.' In other parts of the examination question papers, the topic–skill combinations are not aligned with those of previous years. This is due, first, to the unconventional integration of topics or alternative skill combinations (for example, mixing annuities and lump sums). Secondly, some topics are distributed across different sections of the paper, meaning that in one year some subtopics may be easy (e.g., in Section A) and in another year the same subtopics may be challenging (e.g., in Section B). Under conventional integrated topics, the items are not scaffolded, and their framing differs significantly. In principle, the underlying structure of items within any topic may be altered, and topics may be integrated; increasing or decreasing item difficulty directly influences the topic–skill pairing. For those reasons, the topic–skill pair can be considered unpredictable.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how items are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items

across 2022–2024 reflects both consistency in structure and presentation for 'traditional' Mathematics items and inconsistency where integration is evident, thus leading to fluctuations in the difficulty of subtopics/items. The framing is free of conceptual items (except in parts where such items are expected) but includes enough application items (in parts where such items are not expected). This practice renders the items in the examination question papers unpredictable.

Summary of findings and recommendations for the IEB Mathematics Finance topic

Table 3.3.8 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.3.8: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Finance Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in examination question papers fully justified.
Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and this adherence indicates some predictability, which is mandatory but not unacceptable.
Identified unacceptable predictability on topic weighting

The topic weighting is fixed at 15 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
There is none, since deviation from the required weighting would breach the CAPS.
Identified unacceptable predictability on item types
In Finance, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Finance items that require candidates to explain, interpret, compare or justify solutions, not only calculations.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Set item-type targets at the examination construction stage and oversee adherence throughout moderation.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates weak repetition of fixed topic–skill combinations.
Identified unacceptable predictability in the scenario framing of items
The observed patterns indicate that the framing of financial items across 2022–2024 reflects both inconsistencies in structure and in presentation.

Table 3.3.9 summarises the analysis conducted to determine the level of predictability for the Calculus topic for IEB Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.3.9: Findings on the Predictability of the Calculus Topic for the IEB Mathematics Paper 1 Examinations from 2022–2024

Topic: Calculus									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	3a	Differentiation	4	36	Procedural Task	2	2	Using the first principles
		3b	Differentiation	4		Procedural Task	2	3	Differentiation rules
		3c1	Quadratic functions	4		Procedural Task	1	2	Finding intercepts from standard form
		3c2	Tangents to a quadratic function	5		Procedural Task	2	3	Application of Calculus principles
		5a	Cubic polynomial functions	5		Procedural Task	2	2	Finding stationary points via derivative
		5b	Cubic polynomial functions	3		Procedural Task	2	2	Sketching the graph of gradients

		5c	Tangent to cubic	5		Procedural Task	2	2	Finding a gradient and equation at a point
		12	Interpret f from f(x) – find x-intercept	6		Problem-solving	4	4	Demonstrate conceptual understanding
2023	✓	2a	Cubic functions	1	33	Procedural Task	1	1	Determining y-intercept
		2b	Differentiation	3		Procedural Task	1	2	Differentiation rules
		2c	Stationary points	2		Procedural Task	1	2	Finding stationary points via derivative
		2d	Cubic functions	4		Procedural Task	2	2	Sketching cubic functions
		2e	Cubic functions	2		Recall	1	1	Interpretation based on the sketch
		4a1	Differentiation	4		Procedural Task	2	2	Using differentiation rules
		4a2	Differentiation	3		Procedural Task	2	2	Using differentiation rules

		4b	Tangents	3		Procedural Task	3	3	Demonstrate conceptual understanding
		4c	Differentiation	3		Procedural Task	2	2	Using the first principles
		12a	Analytical Geometry and straight lines	2		Procedural Task	1	2	Modelling
		12b	Optimisation	6		Problem-solving	4	4	Modelling
2024	✓	3a	Differentiation	5	37	Procedural Task	2	2	Using first principles
		3b	Differentiation	4		Procedural Task	2	2	Using differentiation rules
		3c1	Quadratic functions	3		Procedural Task	2	1	Finding intercepts from standard form
		3c2	Quadratic functions	3		Procedural Task	2	1	Finding the turning point
		3c3	Tangents and gradients	1		Procedural Task	1	1	Evaluating the gradient of a tangent
		3c4	Tangents and gradients	4		Procedural Task	2	1	Evaluating the gradient of a tangent
		5a	Cubic function	4		Procedural Task	2	2	Determining parameter of cubic

		5b1	Cubic function	4		Procedural Task	2	2	Determine coordinates of turning point
		5b2	Cubic function	2		Procedural Task	2	1	Determining x-intercepts
		11	Optimisation	7		Problem-solving	4	4	Application of Calculus

Table 3.3.9 presents a comparative overview of the Calculus topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.3.9 have contributed to the predictability of the IEB Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Calculus topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic and its subtopics are not necessarily compartmentalised into sections or questions in examination question papers from year-to-year. The decompartmentalised arrangement of questions renders the whole examination paper unpredictable, since the order of topics cannot be easily determined from past examination papers. The topics are rotated within sections and questions yearly; this rotation affects the difficulty and cognitive demands of items, minimising reliance on past papers and reducing predictability.

b. Content coverage

The CAPS requires that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined yearly, but not necessarily under the same topics. In parts where a subtopic is not tested under its assigned topic, it emerges from integrating or modelling various topics. The varying arrangement of subtopics in examination question papers indicates unpredictability.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 35 marks of the total marks of the examination question papers should be allocated to Calculus, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Calculus has remained largely consistent across the three years, with each paper assigning 35 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Calculus subtopics; the same item types are used over the years. In all three years, the Calculus items are procedural. This lack of variety in item type contributes to high predictability: candidates can expect that most marks will be earned through routine algorithmic application rather than explaining and recalling mathematical facts. This pattern can be avoided by designing items that require candidates to explain, recall mathematical facts, compare or justify, rather than merely calculate, thereby broadening the evidence of conceptual understanding. On the other hand, the evaluation indicates that the levels of difficulty, cognitive levels, and the mark allocation for the items vary considerably across topics, through integration of topics, modelling and a significant number of problem-solving items. Overall, the examination question papers have different tones each year, which may be disturbing for candidates and make them fairly unpredictable.

e. Topic and skill pairing

The analysis indicates that the topic–skill combinations remain relatively similar for parts that consist of 'traditional' Mathematics items, such as 'differentiation.' In other parts of the examination question papers, the topic–skill combinations are not aligned with those of previous years. This is due, first, to the unconventional integration of topics or alternative skill combinations (e.g., applying logic to a non-routine item). Secondly, some topics are distributed in different sections of the paper, meaning that in one year some subtopics may be easy (e.g., in Section A) and in another year the same subtopics may be challenging (e.g., in Section B). Under conventional integrated topics (for example, application of Calculus), the items are not scaffolded, and the framing of items is very different. In principle, the underlying structure of items within any topic may be altered, and topics may be integrated; increasing or decreasing item difficulty directly influences the topic–skill pairing. For those reasons, the topic–skill pair can be considered unpredictable.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items across 2022–2024 reflects both consistency in structure and presentation for 'traditional' Mathematics items and inconsistency when integration is involved, thus accounting for fluctuations in the difficulty of subtopics/items. The framing is free of conceptual items (except in parts where such items are expected) but includes enough application items (in parts where such items are not expected). This practice renders the items in the examination question papers unpredictable.

Summary of findings and recommendations for the IEB Mathematics Calculus topic

Table 3.3.10 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.3.10: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Calculus Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in examination question papers fully justified.
Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and the adherence indicates predictability, which is mandatory but not unacceptable.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 35 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
There is none, since deviation from the required weighting would breach the CAPS.
Identified unacceptable predictability on item types

In Calculus, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Calculus items that require candidates to explain, interpret, compare or justify solutions, not only calculations.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Set item-type targets at the examination construction stage and oversee adherence throughout moderation.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates weak repetition of fixed topic–skill combinations.
Identified unacceptable predictability in the scenario framing of items
The observed patterns indicate that the framing of Calculus items across 2022–2024 reflects inconsistencies in structure and presentation.

Table 3.3.11 below summarises the analysis conducted to determine the level of predictability for the Probability topic for IEB Mathematics Paper 1 examinations from 2022 to 2024.

Table 3.3.11: Findings on the Predictability of the Probability Topic for the IEB Mathematics Paper 1 Examinations from 2022–2024

Topic: Probability									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	10a1	Permutations	1	14	Procedural	1	1	Understanding factorials

		10a2	Permutations with constraints	2		Procedural	1	2	Understanding combinatorics
		10a3	Permutations	4		Procedural	2	2	Understanding combinatorics
		10b1	Fractions and ratios	1		Procedural	1	1	Simplifying and interpreting fractions
		10b2	Binomial probability	2		Procedural	2	2	Applying formulas for "exactly k successes/failures in n trials"
		10c	Independent events	4		Procedural	3	3	Solving for parameter
2023	✓	11a1i	Counting	2	17	Procedural	1	1	Knowing how to count arrangements
		11a1ii	Counting	3		Procedural	1	1	Knowing how to count arrangements
		11a2	Counting	4		Procedural	4	3	Understanding permutations, combinations, and the difference between "with" and "without" repetition
		11b1	Probability and functions	4		Problem-solving	4	4	Understanding modelling

		11b2	Probability and functions	1		Problem-solving	4	4	Understanding modelling
		11b3	Probability and functions	3		Problem-solving	4	4	Understanding modelling
2024	✓	12a1	Counting	2	14	Procedural	2	2	Knowing how to count arrangements
		12a2	Counting	5		Procedural	4	4	Knowing how to count arrangements
		12b	Venn diagram	7		Procedural	4	4	Determining region counts x, y, z from given probabilities and totals

Table 3.3.11 presents a comparative overview of the Probability topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.3.11 have contributed to the predictability of the IEB Mathematics final examination Paper 1 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Probability topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic and its subtopics are not necessarily compartmentalised into sections or questions in examination papers from year to year. The decompartmentalised arrangement of questions renders the whole examination paper

unpredictable, since the order of topics cannot be easily determined from past examination papers. The topics are rotated within sections and questions yearly; this rotation affects the difficulty and cognitive demands of items, minimising reliance on past papers and reducing predictability.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined yearly, but not necessarily under the same topics. In parts where a subtopic is not tested under its assigned topic, it emerges from integrating or modelling various topics. The varying arrangement of subtopics in examination question papers indicates unpredictability.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 15 marks of the total marks of the examination question papers should be allocated to Probability, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Probability has remained largely consistent across the three years, with each paper assigning 15 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Probability subtopics; the same item types are used over the years. In all three years, the Probability items are procedural. This lack of variety in item type contributes to high predictability: candidates can expect that most marks will be earned through routine algorithmic application rather than explaining and recalling mathematical facts. This pattern can be avoided by designing items that require candidates to explain, recall mathematical facts, compare or justify, rather than merely calculate, thereby broadening the evidence of conceptual understanding. On the other hand, the evaluation indicates that

the levels of difficulty, cognitive levels, and the allocation of marks for the items vary considerably across topics, due to the integration of topics, modelling, and a significant number of problem-solving items. Overall, the examination question papers have different tones each year; this may be disturbing for candidates and make them fairly unpredictable.

e. Topic and skill pairing

The analysis indicates that the topic–skill combinations remain relatively similar for parts that consist of 'traditional' Mathematics items, such as 'working on Venn diagrams.' In other parts of the examination question papers, the topic–skill combinations are not aligned with those of previous years. This is due, first, to the unconventional integration of topics (for example, Probability and Functions) or alternative skill combinations (e.g., applying logic to a non-routine item). Secondly, some topics are distributed across sections of the paper, meaning that in one year some subtopics may be easy (e.g., in Section A) and in another year the same subtopics may be challenging (e.g., in Section B). Under conventional integrated topics (for example, Calculus application), the items are not scaffolded, and the framing of items is very different. In principle, the underlying structure of items within any topic may be altered, and topics may be integrated; increasing or decreasing item difficulty directly influences the topic–skill pairing. For those reasons, the topic–skill pair can be considered unpredictable.

f. Scenario framing of items for a topic

In Mathematics, the framing of items concerns how they are structured, worded, and presented to measure the intended skills accurately and fairly. The patterns observed in the analysed examination question papers indicate that the framing of topic items across 2022–2024 reflects both consistency in structure and presentation for 'traditional' Mathematics items and inconsistency where integration is evident, thus leading to fluctuations in the difficulty of subtopics/items. The framing is free of conceptual items (except in parts where such items are expected) but includes enough application items (in parts where such items are not expected). This practice renders the items in the examination question papers unpredictable.

Summary of findings and recommendations for the IEB Mathematics Probability topic

Table 3.3.12 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.3.12: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Probability Topic Paper 1

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in examination question papers fully justified.
Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and this adherence indicates some predictability, which is mandatory but not unacceptable.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 15 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting

There is none, since deviation from the required weighting would breach the CAPS.
Identified unacceptable predictability on item types
In Probability, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Probability items that require candidates to explain, interpret, compare or justify solutions, not only calculations.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Set item-type targets at the examination construction stage and oversee adherence throughout moderation.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates weak repetition of fixed topic–skill combinations.
Identified unacceptable predictability in the scenario framing of items
The observed patterns indicate that the framing of Probability items across 2022–2024 reflects both inconsistencies in structure and in presentation.

Conclusions

Based on the evaluation of the 2022–2024 IEB Mathematics Paper 1 final examinations, the question papers demonstrate strong predictability in topic coverage, content coverage, topic weighting, item types, and topic–skill pairing. While topic coverage, content coverage, and topic weighting are curriculum requirements, item types and topic–skill pairing are assessment flaws. Firstly, the CAPSs assert that "modelling as a process should be included in all papers, thus contextual questions can be set on any topic." However, contextual questions are limited to the expected questions/items evaluated in the examination papers. Secondly, the

CAPS asserts that "questions will not necessarily be compartmentalised in sections. Various topics can be integrated into a single question." However, topics are mostly grouped per question in the evaluated question papers. These two factors result in very predictable examination question papers.

Setting an examination paper is a balancing act. In practice, a balance in the difficulty levels, cognitive demands, question/item types, mark allocation, content coverage, and skills assessed is required. A significant change in one of these elements affects all the other elements, thereby achieving unpredictability. In Mathematics examination question papers, a significant change in the items is often achieved by using modelling or integrating topics. Accordingly, any significant change to questions/items affects the fairness, comprehensiveness, and the way candidates engage with the examination paper. IEB Mathematics examination question papers analysed reflect significant changes in the items over the years and are thus less predictable. The design of IEB Mathematics examination question papers reflects creativity, testing mathematical understanding rather than rote learning. However, there is a need to add the 'item-type' to the checklist used during the examination construction stage and to oversee adherence throughout moderation, to ensure that different 'item-types' are considered.

3.4: MATHEMATICS PAPER 2

This section presents an analysis of the IEB final examination question papers from 2022 to 2024 for Mathematics Paper 2 topics. The findings for each topic are summarised in Tables 3.4.1–3.4.8.

Table 3.4.1 below summarises the analysis conducted to determine the level of predictability for the Statistics topic for IEB Mathematics Paper 2 examinations from 2022 to 2024.

Table 3.4.1: Findings on the Predictability of the Statistics Topic for the IEB Mathematics Paper 2 Examinations from 2022–2024

Topic: Statistics									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	1a1	Ogives	3	22	Procedural	2	1	Finding the interquartile range from a cumulative frequency curve
		1a2	Ogives	1		Procedural	1	1	Finding the 50th percentile (median) from a cumulative frequency curve
		1a3	Ogives	1		Procedural	1	1	Finding the percentage below a given value (defect rate)
		1b1	Box-and-whisker plots	1		Procedural	1	1	Identifying skewness
		1b2	Box-and-whisker plots	1		Procedural	3	1	Interpreting proportions in intervals
		1b3	Box-and-whisker plots	3		Procedural	2	1	Finding outliers
		3a1	Median	2		Procedural	2	1	Using the Median equation

		3a2	Standard deviation	2		Procedural	2	1	Calculating the standard deviation –
		3a3	Standard deviation	3		Procedural	2	1	Applying the empirical rule
		3b1	Correlation	1		Procedural	1	1	Understanding regression context
		3b2	Linear regression	2		Procedural	1	1	Using regression equation for prediction
		3b3	Correlation	2		Procedural	3	3	The effect of adding an outlier point
2023	✓	1a1	Box-and-whisker plots	1	21	Procedural	1	1	Determining the minimum value
		1a2	Box-and-whisker plots	1		Procedural	1	1	Determining upper quartile
		1b	Box-and-whisker plots	2		Procedural	2	1	Finding outliers
		1c1	Linear regression	3		Procedural	2	2	Predicting values using least-squares line y = a + bx (extrapolation)
		1c2	Linear regression	2		Procedural	1	2	Comment on reliability of prediction (extrapolation vs interpolation)

		3a	Frequency polygon	3		Procedural	2	2	Estimating mean from frequency distribution
		3b	Frequency polygon	1		Procedural	1	2	Determining percentage of data in a given class interval
		3c	Ogives	3		Procedural	2	2	Drawing cumulative frequency curve
		3d1i	Ogives	1		Procedural	1	2	Locating median on cumulative frequency curve
		3d1ii	Ogives	2		Procedural	1	2	Locating quartiles for interquartile range on cumulative frequency curve
		3d2	Skewness	2		Explanation	2	2	Describing the skewness
2024	✓	Q.7.a	Regression	2	20	Procedural	1	2	Determining equation of least-squares line from summary statistics
		Q.7.b	Regression	4		Procedural	1	2	Drawing regression line using intercepts and mean point
		Q.7.c	Regression	2		Procedural	1	2	Using the regression line to make a prediction (substitution)

		Q.7.d	Correlation	1		Procedural	1	2	Calculating the correlation coefficient r
		Q.7.e	Outliers	1		Recall	1	1	Identifying outliers from scatter plot
		Q.7.f	Correlation	1		explanation	1	1	Describing effect of outlier on strength of correlation
		Q.8.a	Ogives	3		Problem-solving	2	4	Interpreting change in median when upper classes are removed
		Q.8.b	Skewness	2		Procedural	1	1	Comparing the mean and median using box plot information
		Q.8.c	Standard deviation	4		Procedural	2	2	Using the σ formula

Table 3.4.1 presents a comparative overview of the Statistics topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components listed in Table 3.4.1 have contributed to the predictability of the IEB Mathematics final examination Paper 2 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Statistics topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and

examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic and its subtopics are not necessarily compartmentalised into sections or questions in examination question papers from year to year. The decompartmentalised arrangement of questions renders the whole examination paper unpredictable since the topic arrangement cannot be easily determined from past examination papers. The topics are rotated within sections and questions yearly; this rotation affects the difficulty and cognitive demands of items, minimising reliance on past papers and reducing predictability.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year, and the consistent presence and arrangement of the subtopics in the examination question papers indicate a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 20 marks of the total marks of the examination question papers should be allocated to Statistics, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Statistics has remained largely consistent across the three years, with each paper assigning 20 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 2 examinations indicate little to no variation in the item types used to assess Statistics subtopics; the same item types are used over the years. In all three years, the

Statistics items are procedural. This lack of variety in item type contributes to high predictability: candidates can expect that most marks will be earned through routine algorithmic application rather than explaining and recalling mathematical facts. This pattern can be avoided by designing items that require candidates to explain, recall mathematical facts, compare or justify, rather than merely calculate, thereby broadening the evidence of conceptual understanding. On the other hand, the evaluation indicates that the levels of difficulty, cognitive levels, and the allocation of marks for the items vary considerably across topics, due to the integration of topics, modelling, and a significant number of problem-solving items. Overall, the examination question papers have different tones each year; this may be disturbing for candidates and make them fairly unpredictable.

e. Topic and skill pairing

To evaluate the predictability of examination question papers, it is crucial to examine how specific cognitive skills have been paired with particular topics over time. Consistent assessment of the same skills, such as interpretation, calculation, analysis, or explanation, when linked to a specific topic across multiple years, may signal a recurring pattern, potentially leading to predictability. Conversely, variation in skill pairing can help ensure a more comprehensive assessment of the intended learning outcomes. This section explored the extent to which skill demands associated with this topic have remained consistent or varied across the past three years and determined whether such patterns suggest predictability in assessment design. If predictable patterns are observed, specific recommendations are offered to encourage greater variation; however, measures are proposed to preserve this consistency in forthcoming assessments when a balanced approach is in place.

The analysis indicates that the topic–skill combinations differ greatly. The variation in the subtopics assessed each year weakens the topic–skill correlation, thereby reducing overall predictability.

f. Scenario framing of items for a topic

In Mathematics, item framing focuses on how items are structured, worded, and presented to measure the intended skills accurately and fairly. The contexts used in each question vary, meaning the wording of the scenarios differs across 2022–2024. The framing in relation to the structure and presentation also varies. The IEB uses several distinct representations from year-to-year, including two-variable tables, scatter plots, ogives, and box-and-whisker plots. This practice makes Statistics unpredictable.

Summary of findings and recommendations for the IEB Mathematics Statistics topic

Table 3.4.2 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.4.2: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Statistics Topic Paper 2

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in examination question papers fully justified.
Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and this adherence indicates some predictability, which is mandatory but not unacceptable.

Recommendations to avoid predictable content coverage
No avoidance is required. Predictability is due to the CAPS requirements.
Strategies to maintain content coverage that do not lead to a predictable question paper
Track content coverage and ensure CAPS compliance.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 20 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
None, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper
Track topic weighting and ensure CAPS compliance.
Identified unacceptable predictability on item types
In Statistics, the examination question papers are dominated by procedural items. This lack of variety in item type contributes to high predictability. Candidates can expect that most marks will be earned through routine algorithmic application.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design statistics items that require candidates to explain, interpret, compare or justify solutions, not only calculations.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Set item-type targets at the examination construction stage and oversee adherence throughout moderation.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates weak repetition of fixed topic–skill combinations.

Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
Track topic–skill pairing and ensure variation.
Identified unacceptable predictability in the scenario framing of items
The patterns observed indicate that the framing of statistics items across 2022–2024 reflects inconsistencies in both structure and presentation.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Track the framing of items and ensure variation.

Table 3.4.3 below summarises the analysis conducted to determine the level of predictability for the Analytical Geometry topic for IEB Mathematics Paper 2 examinations from 2022 to 2024.

Table 3.4.3: Findings on the Predictability of the Analytical Geometry Topic for the IEB Mathematics Paper 2 Examinations from 2022–2024

Topic: Analytical Geometry									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	2a	Angle of inclination	2	35	Procedural	2	1	Calculating the angle of inclination
		2b	Equation of parallel lines	3		Procedural	2	1	Working on parallel lines
		2c	Equation of a line perpendicular	3		Procedural	2	1	Working on perpendicular lines

		2d1	Coordinates of a point and length of a segment	5		Procedural	2	2	Finding the coordinates at a point of intersection and using the distance formula
		2d2	Coordinates of a point and length of a segment	4		Procedural	2	2	Classifying triangle using side lengths (isosceles) in coordinate Geometry
		9a	Circles	4		Procedural	2	2	Finding centre and radius from general form equation
		9b	Intersection of line and circle	6		Procedural	2	2	Determining coordinates of points (simultaneous equations)
		9c1	Midpoint formula	4		Procedural	2	2	Solving a quadratic equation, finding the coordinates of a point and using the midpoint formula
		9c2	Collinearity	4		Procedural	3	2	Testing if line passes through midpoint
		9d	Tangency	4		Procedural	3	2	Using distance between centres and radii
2023	✓	2a1	Gradient	2		Procedural	1	1	Calculating gradient of a line segment between two points
		2a2	Equation of a line	3		Procedural	2	1	Finding the equation of a line using coordinates and right-angle condition

		2b	Equation of a line	5		Procedural	2	2	Finding the equation of a line and coordinates of a point, using properties of parallel lines
		2c1	Parallelogram in coordinate Geometry	3		Procedural	3	3	Finding the coordinates of a point using vector/translation properties
		2c2	Angle between lines	4		Procedural	3	2	Using the gradients and Trig ratios to find angles
		2c3	Area of parallelogram	5		Procedural	3	3	Calculating the area of a part using side lengths and included angle or vector methods
		11a	Circles	5		Procedural	3	2	General form equation of circle from tangency information
		11b	Tangents to circles	7		Procedural	3	3	Determining equation of tangent to a circle using gradient relationships
		11c	Relation between two circles	5		Procedural	3	3	Testing for intersection using distance between centres and radii
2024	✓	2a	Parallelogram in coordinate Geometry	2	38	Procedural	1	2	Using the properties of a parm in context
		2b	Distance formula	2		Procedural	1	2	Using the distance formula to calculate length

		2d	Parallel lines	3		Procedural	1	2	Finding the equation of a line parallel to a given line through a point
		2e	Quadrilaterals	3		Procedural	1	2	Proving that a quadrilateral is a rhombus (compare lengths or gradients)
		3a	Circle	3		Procedural	1	2	Finding centre and radius from general form equation
		3b	Point of intersection	4		Procedural	1	2	Finding the point of intersection when one value is known
		3c	Tangency	3		Procedural	2	2	Knowing the relation between the tangent and radius, finding equations of perpendicular lines
		3d	Circle Geometry in coordinates	3		Procedural	2	2	Understanding of circle Geometry theorems and calculation of an inclined angle
		13a	Circle	3		Procedural	2	2	Using basic arithmetic, parallel axis
		13b	Circles	3		Procedural	2	2	Tangent radius theorem, Pythagoras, circle formula
		13c	Circles	2		Problem-solving	3	4	Condition for two circles not to intersect or touch

		14a	Circle	7		Problem-solving	4	4	Ability to break the problem into constituent parts

Table 3.4.3 presents a comparative overview of the Analytical Geometry topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components reflected in Table 3.4.3 have contributed to the predictability of the IEB Mathematics final examination Paper 2 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Analytical Geometry topic appears consistently in all three NSC final examination question papers (2022–2024)as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate. The findings also indicate that the topic and its subtopics are not necessarily compartmentalised into sections or questions in examination question papers from year to year. The decompartmentalised arrangement of questions renders the whole examination question paper unpredictable since the arrangements of topics cannot be easily determined from past examination question papers. The topics are rotated within sections and questions yearly; this rotation affects the difficulty and cognitive demands of items, minimising reliance on past papers and reducing predictability.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that a range of subtopics are examined under the same topic each year. Similar subtopics are tested for differences in difficulty and cognitive levels, making content coverage unpredictable.

c. Weighting of the topic

The DBE CAPS Mathematics Curriculum and Mathematics SAGs prescribe that 40 marks of the total marks of the examination question papers should be allocated to Analytical Geometry, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Analytical Geometry has remained largely consistent across the three years, with each paper assigning 40 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 2 examinations indicate little to no variation in the item types used to assess Analytical Geometry subtopics; the same item types are used over the years. In all three years, the Analytical Geometry items are procedural. This lack of variety in item type contributes to high predictability: candidates can expect that most marks will be earned through routine algorithmic application rather than explaining and recalling mathematical facts. This pattern can be avoided by designing items that require candidates to explain, recall mathematical facts, compare or justify, rather than merely calculate, thereby broadening the evidence of conceptual understanding. On the other hand, the evaluation indicates that the levels of difficulty, cognitive levels, and the mark allocation for the items vary considerably across the topic due to changes in the skills assessed and a significant number of problem-solving items (e.g., in relation to the proportion of marks). Overall, the examination question papers have different tones each year; this may be disturbing for candidates and make them fairly unpredictable.

e. Topic and skill pairing

The analysis indicates that the topic–skill combinations differ greatly, and the variation in the framing of most items weakens the overall predictability.

f. Scenario framing of items for a topic

In Mathematics, item framing focuses on how items are structured, worded, and presented to measure the intended skills accurately and fairly. The observed patterns indicate that the framing of Analytical Geometry items across 2022–2024 reflects inconsistencies in structure, wording, and presentation, while remaining focused on procedural fluency. The variance in the framing is noticeable in the varying difficulty of the items, resulting in unpredictability.

Summary of findings and recommendations for the IEB Mathematics Analytical Geometry topic

Table 3.4.4 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.4.4: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Analytical Geometry Topic Paper 2

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in examination question papers fully justified.
Identified unacceptable predictability on content coverage

There is no unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and this adherence indicates some predictability, which is mandatory but not unacceptable.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 40 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Strategies to maintain topic weighting that do not lead to a predictable question paper
Track topic weighting and ensure compliance with the CAPS.
Identified unacceptable predictability on item types
In Analytical Geometry, the examination question papers are dominated by procedural items, and a significant proportion of problem-solving items were noted in one year. The items differ greatly in the levels of difficulty across the years. Thus, it leads to variety in item types and reduces predictability.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Analytical Geometry items that require candidates to explain, interpret, compare or justify solutions, not only calculations.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Set item-type targets at the examination construction stage and oversee adherence throughout moderation.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates weak repetition of fixed topic–skill combinations.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper

Track topic–skill pairings and ensure year-to-year variation.
Identified unacceptable predictability in the scenario framing of items
The observed patterns indicate that the framing of Analytical Geometry items across 2022–2024 reflects inconsistencies in both structure and presentation.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Track the framing of items and ensure year-to-year variation.

Table 3.4.5 below summarises the analysis conducted to determine the level of predictability for the Trigonometry topic for IEB Mathematics Paper 2 examinations from 2022 to 2024.

Table 3.4.5: Findings on the Predictability of the Trigonometry Topic for the IEB Mathematics Paper 2 Examinations from 2022–2024

Topic: Trigonometry									
Year	**Topic Examined**	**Content/Topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	4a	Trig graphs	1	50	Recall	1	1	Knowing the period of f(x)=sin3x
		4b	Trig graphs	2		Procedural	2	2	Working out the range of g(x)=cos(x−30°)
		4c	Trig graph and equations	1		Recall	1	1	Reading the graph based on context

		4d	Trig graph and inequalities	2		Procedural	2	2	Reading the graph based on context
		7a	Proof of the area rule	4		Procedural	2	2	Proving of the area rule in an acute-angled triangle
		7b	3D objects	4		Procedural	2	2	Surface area – use area rule
		8a	Trig equations	5		Procedural	3	2	Solving in a given interval
		8b	Trig identities	5		Procedural	3	2	Simplifying expressions using compound and reduction formulae
		10	3D Trigonometry	7		Procedural	4	3	Complex calculations
		11a	Trig identities	5		Procedural	2	2	Proving a compound identity
		11b	Trig identities	6		Procedural	3	2	Determining non-permissible values for which identity fails
		14a	Compound angle identities and Trig equations	6		Problem-solving	4	4	Higher-order reasoning and processes
		14b	Maximising a Trig expression using the R-formula	2		Problem-solving	4	4	Higher-order reasoning and processes

2023	✓	6a	Trig graphs	6	53	Procedural	2	2	Sketching Trig graphs
		6b	Trig graphs and equations	5		Procedural	2	2	Solving Trig equations f(x)=g(x)
		6c1	Trig graphs and inequalities	1		Procedural	2	2	Values where f(x) ≥ g(x) from graph
		6c2	Trig inequalities	2		Procedural	2	2	Determine values where f(x) ·g(x) < 0 from graph
		7	Circle	7		Procedural	3	3	Using right triangle and tangent-radius relationships to determine CD
		8a	Trig identities	4		Procedural	3	3	Derivation from given information
		8b	Trig equations	3		Procedural	2	3	Derivation from given information
		9a	Trig simplification	7		Procedural	2	2	Reducing an expression in terms of a single Trig ratio of θ
		9b1	Trig identities	5		Procedural	2	2	Proving identities
		9b2	Trig equations	5		Procedural	3	3	Finding the general solution (non-

									permissible values)
		13	3D Trigonometry	8		Problem-solving	4	4	Solving 3D problems using Trigonometry
2024	✓	Q.2.c	Angle of inclination	3	49	Procedural	1	2	determining θ from gradient using θ = arctan(m)
		Q.5.a	Trig graphs	1		Knowledge	1	1	Determining amplitude or vertical stretch factor from sketch
		Q.5.b	Trig graphs	1		Knowledge	1	1	Determining period of a sine function from sketch
		Q.5.c	Trig graphs	3		Procedural	2	2	Sketching a transformed cosine graph on given axes
		Q.5.d	Trig graphs	1		Knowledge	1	1	Stating the amplitude of the transformed cosine graph
		Q.5.e	Trig graphs and equations	2		Procedural	2	2	Solving f(x) = g(x) for x in a given interval
		Q.5. f.1	Trig graphs and inequalities	1		Procedural	2	2	Determining x-values where

									$f(x) \geq g(x)$ from graphs
		Q.5. f.2	Trig graphs and inequalities	2		Procedural	2	2	Determine x-values where $f(x) \cdot g(x) < 0$ (opposite signs)
		Q.5. f.3	Trig graphs and inequalities	2		Procedural	2	2	Determining intervals where the gradient of a Trig function is positive (increasing)
		Q.5.g	Trig graphs and transformations	2		Procedural	1	2	Describing combined vertical and horizontal shifts of a Trig graph
		Q.6. a.1	Trig identities	2		Procedural	1	1	Using the product-to-sum or compound-angle identities to simplify an expression
		Q.6. a.2	Trig identities	3		Procedural	1	2	Expressing $\cos(2\theta)$ etc. in terms of $\sin\theta$ and $\cos\theta$ and simplifying
		Q.6. a.3	Trig ratios	1		Procedural	1	2	Determining an exact value such as tan

									(50°) from given relationships
		Q.6.b	Cosine rule	3		Procedural	1	2	Applying rule in non-right-angled triangles
		Q.11.a	3D Trigonometry	4		Procedural	2	2	Deriving the relationship AC = 10 tan θ in a spatial diagram
		Q.11.b	3D Trigonometry	4		Procedural	2	2	Solving for θ from equation derived in a 3D context
		Q.12.a	Trig identities	7		Procedural	2	2	Proving a compound identity using the reduction and double-angle formulae
		Q.12.b	Trig equations	7		Procedural	3	3	Solving equations in a given interval

Table 3.4.5 presents a comparative overview of the Trigonometry topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components reflected in Table 3.4.5 have contributed to the predictability of the IEB Mathematics final examination Paper 2 from 2022 to 2024.

a. Topic coverage

The findings indicate that Trigonometry appears consistently across all three NSC final examination question papers (2022–2024), as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS mandate.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of subtopics in examination question papers indicate a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 50 marks of the total marks of the examination question papers should be allocated to Trigonometry, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Trigonometry has remained largely consistent across the three years, with each paper assigning 50 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The evaluation indicates that across the three-year period (2022–2024), the Mathematics Paper 1 examinations indicate little to no variation in the item types used to assess Trigonometry subtopics; the same item types are used over the years. In all three years, the Trigonometry items were mostly procedural. This lack of variety in item type contributes to high predictability: candidates can expect

that most marks will be earned through routine algorithmic application rather than explaining and recalling mathematical facts. This pattern can be avoided by designing items that require candidates to explain, recall mathematical facts, compare or justify, rather than merely calculate, thereby broadening the evidence of conceptual understanding. On the other hand, the evaluation indicates that the levels of difficulty, cognitive levels, and the mark allocation for the same subtopic vary across the years. For example, in 2022 '3D Trigonometry' was a very difficult and complex procedure, in 2023 '3D Trigonometry' was very difficult and problem-solving and in 2024 '3D Trigonometry' was moderately difficult and a routine procedure. Overall, the examination question papers have different tones each year, which may be disturbing for candidates and make them fairly unpredictable.

e. Topic and skill pairing

The analysis indicates that the topic–skill combinations differ greatly. One year, a subtopic may require a basic skill; the next year, an advanced skill; and thereafter, an intermediate skill. This is noted in the variance in the difficulty levels and cognitive demands of the same subtopic. The variation in the framing of most items weakens the overall predictability.

f. Scenario framing of items for a topic

In Mathematics, item framing focuses on how items are structured, worded, and presented to measure the intended skills accurately and fairly. The observed patterns indicate that the framing of Trigonometry items across 2022–2024 reflects inconsistencies in structure, wording, and presentation, while remaining focused on procedural fluency. The variance in framing is evident in the differing difficulty of similar items/subtopics, resulting in unpredictability.

Summary of findings and recommendations for the IEB Mathematics Trigonometry topic

Table 3.4.6 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.4.6: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Trigonometry Topic Paper 2

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in examination question papers fully justified.
Identified unacceptable predictability on content coverage
There is no unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered them appropriately as required by the CAPS, and this adherence indicates predictability, which is mandatory but not unacceptable.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 50 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Recommendations to avoid unacceptable predictability on topic weighting
There is none, since deviation from the required weighting would breach the CAPS.
Strategies to maintain topic weighting that do not lead to a predictable question paper

Track topic weighting and ensure compliance with the CAPS.
Identified unacceptable predictability on item types
In Trigonometry, the examination question papers are dominated by procedural items, and a significant proportion of problem-solving items were noted in one year. The items differ greatly in difficulty across years. Thus, it leads to variety in item types and reduces predictability.
Recommendations to avoid unacceptable predictability on item types
Include items that require remembering mathematical facts and definitions. Design Analytical Geometry items that require candidates to explain, interpret, compare or justify solutions, not only calculations.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Set item-type targets at the examination construction stage and oversee adherence throughout moderation.
Identified unacceptable predictability on topic–skill pairing
The analysis indicates weak repetition of fixed topic–skill combinations.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
Track topic–skill pairings and ensure year-to-year variation.
Identified unacceptable predictability in the scenario framing of items
The observed patterns indicate that the framing of Trigonometry items across 2022–2024 reflects inconsistencies in structure and presentation.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Track the framing of items and ensure variation year to year.

Table 3.4.7 below summarises the analysis conducted to determine the level of predictability for the Euclidean Geometry and Measurement topic for IEB Mathematics Paper 2 examinations from 2022 to 2024.

Table 3.4.7: Findings on the Predictability of the Euclidean Geometry and Measurement topic for the IEB Mathematics Paper 2 Examinations from 2022–2024

Topic: Euclidean Geometry and Measurement									
Year	**Topic Examined**	**Content/topic(s) Covered and Marks**			**Weight of the Topic**	**Item Type**	**Level of Difficulty**	**Cognitive Demand**	**Skill Assessed**
2022	✓	5a	Circle Geometry	3	39	Recall	2	1	Stating relevant statements and reasons
		5b1	Circle Geometry	2		Procedural	2	1	Using theorems to determine unknown angle(s)
		5b2	Circle Geometry	3		Procedural	2	1	Using theorems to determine unknown angle(s)
		5b3	Circle Geometry	2		Procedural	2	1	Solving for unknown angle using multiple theorems
		6a	Circle Geometry	2		Recall	1	1	Recalling Geometry facts
		6b	Circle Geometry	2		Recall	1	1	Recalling Geometry facts

		6c	Circle Geometry	3		Procedural	2	2	Using Geometry facts to find the size of an angle
		6d	Right triangles in circles	3		Recall	2	1	Using Geometry facts and Pythagoras in context
		12a	Similarity and proportionality	3		Procedural	2	2	Proving ratio of corresponding sides
		12b	Similarity and proportionality	2		Procedural	2	1	Using ratios to find segment ratio in a triangle
		12c	Parallel lines in triangles	4		Procedural	3	2	Using proportionality to find DF: AB
		13a	Circle Geometry	4		Procedural	2	2	Proving similarity of triangles with tangents and radii
		13b	Circle Geometry	6		Procedural	3	3	Power of a point – relationship $FG^2 = FE \cdot FD$ derived from similarity
2023	✓	4a	Circle Geometry	2	37	Recall	1	1	Using Geometry facts to find the size of an angle
		4b	Circle Geometry	3		Recall	2	1	Using Geometry facts to find the size of an angle
		5a	Proportionality	6		Procedural	2	2	Proving the proportionality theorem
		5b	Proportionality	5		Procedural	2	2	Applying proportionality

		10a	Circle Geometry	4		Procedural	2	1	Proving that a quadrilateral is cyclic
		10b	Circle Geometry	4		Recall	1	1	Using Geometry fact to find the size of an angle
		12a	Similarity and Gircle Geometry	4		Procedural	2	2	Proving similarity of triangles using geometric facts
		12b	Similarity and proportionality	2		Procedural	2	1	Using similar triangles to work out proportionality
		12c	Proportionality and circle Geometry	7		Procedural	3	3	Logic and reasoning
2024	✓	1.a	Circle Geometry	7	43	Recall	1	1	Recalling Geometry facts
		1.b	Circle Geometry	5		Procedural	1	2	Proving a prescribed theorem
		Q.4.a	Circle Geometry	2		Recall	1	1	Recalling Geometry facts
		Q.4.b	Similarity	3		Procedural	2	2	Proving triangles similar
		Q.4.c	Similarity	3		Procedural	2	2	Using similarity to work out the side of triangles
		Q.9.a	Circle Geometry	3		Procedural	1	2	Proving lines are parallel using circle Geometry facts

		Q.9.b	Congruency	6		Procedural	2	2	Proving triangles congruent using circle Geometry facts
		Q.9.c	Proportionality	2		Procedural	2	2	Logic and reasoning
		Q.9.d	Proportionality	3		Procedural	2	2	Logic and reasoning
		Q.10.a	Similarity	1		Recall	1	1	Linking proportionality to similarity
		Q.10.b	Similarity and circle Geometry	2		Procedural	1	2	Logical deduction
		Q.10.c	Cyclic quadrilateral	2		Procedural	1	2	Proving quadrilateral is cyclic
		Q.14.b	Measurement	4		Problem-solving	4	4	Calculating volume of cylinder plus spheres

Table 3.4.7 presents a comparative overview of the Euclidean Geometry and Measurement topic across the three-year period. The analysis, presented in Sections a to f, evaluates whether the components reflected in Table 3.4.7 have contributed to the predictability of the IEB Mathematics final examination Paper 2 from 2022 to 2024.

a. Topic coverage

The findings indicate that the Euclidean Geometry topic appears consistently in all three NSC final examination question papers (2022–2024) as required by the CAPS. Its constant inclusion aligns with the CAPS requirements, which stipulate that this topic must be covered and examined as a key focus area in Grade 12. The frequency of its appearance across the three-year period demonstrates a predictable pattern in topic coverage. This predictability, however, is largely acceptable, as it reflects adherence to the CAPS

mandate. The findings also indicate that the topic is compartmentalised within a particular section (e.g., Euclidean Geometry is in Questions 9 to 11) of the examination question papers, as was the case during the period under review.

b. Content coverage

The CAPS require that all topics and their subtopics be included in every Mathematics examination question paper. The findings indicate that the same subtopics are examined under the same topic each year. The consistent presence and arrangement of subtopics in examination question papers indicate a degree of predictability that is not necessarily unacceptable.

c. Weighting of the topic

The DBE CAPS Mathematics prescribes that 40 marks of the total marks of the examination question papers should be allocated to Euclidean Geometry, with a leeway of ±3 marks. The analysis indicates that marks were within the required range across the three years. The mark allocation for Euclidean Geometry has remained largely consistent across the three years, with each paper assigning 40 ±3 marks. This consistency reflects predictability, as supported by the CAPS.

d. Variation in item types

The analysis indicates that under Euclidean Geometry, the item types differ over the three-year period. Euclidean Geometry offers a variety of recall, procedural, and problem-solving items, and candidates are expected to justify the solutions. This is because each Euclidean Geometry question is unique, as items are based on specific diagrams, theorems, and solution approaches, making this topic unpredictable. The context of a Euclidean Geometry problem changes the reasoning and solution path; thus, different items need specific skills. This makes the Euclidean Geometry topic unpredictable. However, candidates can expect the Euclidean Geometry items to vary in difficulty, ranging from easy recall to moderate procedural and, finally, challenging problem-solving items.

e. Topic and skill pairing

The analysis indicates that under Euclidean Geometry, the topic–skill combinations differ over the three-year period. This is because different subtopics are tested every year in Euclidean Geometry. Each Euclidean Geometry question is unique; the subtopics/items rely on a specific diagram, theorem and approach to a solution, making this topic unpredictable. The context of a Euclidean Geometry problem changes the reasoning and solution path; thus, different items need specific skills. This makes the Euclidean Geometry topic unpredictable.

f. Scenario framing of items for a topic

The analysis indicates that under Euclidean Geometry, the framing differs over the three-year period. This is because each Euclidean Geometry question is unique; items are based on specific diagrams, theorems, and approaches to solving them, making this topic unpredictable. The context of a Euclidean Geometry problem changes the reasoning and solution path; thus, different items need specific skills. This makes the Euclidean Geometry topic unpredictable. However, candidates can expect the Euclidean Geometry items to be of moderate difficulty.

Summary of findings and recommendations for the IEB Mathematics Euclidean Geometry and Measurement topic

Table 3.4.8 below summarises identified patterns of predictability across key components of question paper design, along with corresponding recommendations to reduce predictability and strategies to maintain effective assessment practices without compromising variability.

Table 3.4.8: Summary of Findings and Recommendations on the Predictability of the 2022–2024 IEB Mathematics Euclidean Geometry and Measurement Topic Paper 2

Identified unacceptable predictability on topic coverage
There is no unacceptable predictability. Its annual appearance is mandated by the CAPS, making its presence in Questions 9 – 11 fully justified. However, the items are ordered the same way every year, making this section predictable. This issue will be discussed in detail under 'item' types.
Identified unacceptable predictability on content coverage
No unacceptable predictability. The CAPS and the SAGs outline the content to be covered in the Mathematics examinations. The prevalence of the prescribed subtopics in the compared question papers indicates predictability. The CAPS outlines subtopics; the question papers covered these subtopics appropriately as required by the CAPS, and this adherence indicates some predictability, which is mandatory but not unacceptable.
Recommendations to avoid predictable content coverage
IEB should continue to ensure that the examination question papers cover Trigonometry and its subtopics as required by CAPS.
Strategies to maintain content coverage that do not lead to a predictable question paper
Track content coverage year-on-year and ensure compliance with the CAPS.
Identified unacceptable predictability on topic weighting
The topic weighting is fixed at 40 ±3 marks, as mandated by the CAPS. Although predictable, this consistency is intentional and acceptable.
Strategies to maintain topic weighting that do not lead to a predictable question paper
Track topic weighting year-on-year and ensure compliance with the CAPS.
Identified unacceptable predictability on item types

There is no unacceptable predictability. Euclidean Geometry offers a variety of recall, procedural, and problem-solving items, and candidates are expected to justify the solutions.
Recommendations to avoid unacceptable predictability on item types
The IEB may consider designing Euclidean Geometry items that require candidates to explain and/or justify solutions.
Strategies to maintain the assessment of item types that do not lead to a predictable question paper
Track the item type year-on-year to ensure that items differ from those of previous years and remain balanced.
Identified unacceptable predictability on topic–skill pairing
No unacceptable predictability. The analysis indicates that under Euclidean Geometry, the topic–skill combinations differ over the three-year period.
Strategies to maintain topic–skill pairing that do not lead to a predictable question paper
Track the topic–skill combinations year on year to ensure that skills differ and are maintained in parts in accordance with the item types in the papers.
Identified unacceptable predictability in the scenario framing of items
No unacceptable predictability. The analysis indicates that under Euclidean Geometry, the framing differs over the three-year period. This is because each Euclidean Geometry question is unique, and the items are based on specific diagrams, theorems, and solution approaches, making this topic unpredictable.
Strategies to maintain scenario framing of items that do not lead to a predictable question paper
Track the framing of items year-on-year to ensure variation.

Conclusions

Based on the evaluation of the 2022–2024 IEB Mathematics Paper 1 final examinations, the question papers demonstrate strong predictability on topic coverage, content coverage, and topic weighting. However, the predictability of these elements stems from the CAPS and is therefore acceptable. The examination question papers also indicate limited predictability across item types, topic–skill pairings, and item framing. Resulting in unpredictable examination papers.

Setting an examination paper is a balancing act. In practice, a balance in the difficulty levels, cognitive demands, question/item types, mark allocation, content coverage, and skills assessed is required. A significant change in one of these elements affects all the others, thereby resulting in unpredictability. In Mathematics examination question papers, a significant change in the items is often achieved by using modelling or integrating topics.

Accordingly, any significant change to questions/items affects the fairness, comprehensiveness, and the way candidates engage with the examination paper. The IEB Mathematics examination question papers analysed reflect significant changes in the items over the years and are thus less predictable. The design of IEB Mathematics examination question papers reflects creativity, testing mathematical understanding rather than rote learning. However, there is a need to add the 'item-type' to the checklist used during the examination construction stage and to oversee adherence throughout moderation, to ensure that different 'item-types' are considered.

Section 4: Discussions, Conclusions, and General Recommendations

Sections 3.1–3.4 presented the findings of the evaluation of each topic assessed in the DBE and IEB Mathematics NSC examination papers. These findings were derived from a systematic analysis of examination papers administered between 2022 and 2024 to identify patterns of predictability across the sampled subjects. Building on these findings, this chapter discusses the results in relation to the study's conceptual framework and broader principles of educational assessment. It also presents evidence-based recommendations informed by the observed trends and concludes by reflecting on the implications of the findings for assessment quality, validity, and future examination design.

4.1: Discussions

Evidence presented in Sections 3.1–3.4 indicates that a high level of predictability exists across most topics assessed in the DBE and the IEB Mathematics Paper 1 and Paper 2 examinations. This predictability is particularly evident in topic coverage, content distribution, weighting, item types, and topic–skill pairing. While predictability in topic coverage, content distribution, and weighting is expected given alignment with the CAPS, predictability in item types, question framing, and topic–skill pairing raises important considerations for assessment design and the validity of high-stakes examinations.

For DBE Paper 1, predictability extended beyond curriculum-aligned elements to the structuring of questions, item types, and contextual framing. Although the CAPS advocates the integration of topics and the use of mathematical modelling throughout the examination, the papers analysed were largely characterised by compartmentalised questions, limited topic integration, and recurring contextual formats. The features reduce variation in assessment and increase the likelihood that candidates can anticipate the structure and nature of examination questions. The

apparent reliance on recurring examination templates further reinforces this pattern of predictability.

A similar pattern was observed in DBE Paper 2, where predictability was evident in item types, topic–skill pairing, and question structure. In addition, the distribution of cognitive demand did not consistently align with the CAPS prescriptions, particularly with respect to the balance between knowledge, routine procedures, complex procedures, and problem-solving items. Although the procedural nature of Mathematics, as reflected in the CAPS, partially explains this pattern, the limited variation in cognitive demand and question construction contributes to an examination design that is comparatively predictable.

In contrast, the IEB Paper 1 examination demonstrated predictability primarily in curriculum-driven elements, including topic coverage, content distribution, and weighting, while exhibiting greater variation in item design and question framing. Although some limitations similar to those observed in the DBE were evident, such as topic grouping and limited integration across content areas, the IEB papers incorporated more diverse item construction and contextual approaches. This variation reduces examination predictability and encourages learners to demonstrate conceptual understanding and flexible application of mathematical knowledge.

Similarly, the IEB Paper 2 examination displayed predictable curriculum alignment while indicating greater diversity in item types, topic–skill pairing, and question framing than the corresponding DBE examination. The IEB approach reflects a more dynamic assessment design, incorporating modelling and integration, thereby supporting conceptual understanding instead of rote procedural competence.

Overall, the findings suggest that while curriculum alignment necessitates some degree of predictability, excessive consistency in item types, topic–skill pairings, and question structures may limit the effectiveness of assessments in evaluating higher-order thinking and problem-solving skills.

4.2: Conclusions

The study concludes that the DBE and IEB Mathematics examination papers administered between 2022 and 2024 demonstrate a high degree of predictability in curriculum-aligned elements, including topic coverage, content distribution, and topic weighting. The level of predictability is expected and appropriate, as it reflects alignment with the CAPS and supports fairness and consistency in assessment.

However, the analysis indicates that the DBE Paper 1 and Paper 2 examinations exhibit additional predictability in item types, topic–skill pairing, and question framing. This appears to stem from limited integration of topics, restricted use of mathematical modelling, and possible reliance on recurring examination templates. Consequently, the DBE examinations tend to adopt a more structured and procedural assessment approach.

In contrast, although the IEB Paper 1 and Paper 2 examinations demonstrate similar predictability in curriculum-aligned elements, they display greater variation in item construction, cognitive demand, and question framing. This reduces overall examination predictability while providing greater opportunities to assess conceptual understanding and problem-solving skills.

Overall, the findings suggest that predictability is not inherently problematic when it arises from curriculum alignment. However, predictability that extends beyond curriculum requirements into assessment design features may reduce the capacity of examinations to validly assess the full breadth of mathematical knowledge, skills, and competencies expected of learners.

4.3: General Recommendations

Based on the findings, the following recommendations are proposed:

- Assessment bodies should introduce greater diversity in item types and the framing of questions to reduce structural predictability and enhance assessment quality.
- Greater emphasis should be placed on integrating multiple topics within single questions and incorporating modelling tasks, in line with the CAPS, to promote higher-order thinking.

- Examination designers adopt multi-year rotation matrices that regulate the recurrence of subtopics, skills, item types, and scenario framings.
- Moderation processes at assessment body level should include explicit cross-year comparison to detect emerging patterns.
- Creation and expansion of item-type and scenario banks would help diversify question structures, reducing reliance on familiar templates and mitigating unintentional patterning.
- Implementing routine predictability audits using the six analytical dimensions from the tables in this report would support ongoing monitoring and prevent the emergence of unintended patterns.