NCCA
An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment

Background Paper and Brief for the Review of Leaving Certificate Mathematics

December 2024

Contents

Introduction

The Senior Cycle Review: Advisory Report (NCCA 2022a) was published in March 2022 following the response from the Minister for Education, Norma Foley, TD. Actions outlined in the Advisory Report include a review of existing curriculum components - subjects, modules, and programmes. In March 2022, the Minister for Education requested that NCCA undertake a series of actions to support the realisation of her vision for a redeveloped senior cycle as set out in Equity and Excellence for All (Department of Education, 2022.) One key action set out in this plan was that a schedule of senior cycle subjects and modules for redevelopment be prepared for approval by the Minister.

NCCA subsequently prepared a schedule of subjects for review, which was organised into a number of tranches. The redevelopment of the Leaving Certificate (LC) Mathematics is included in Tranche 3, which will be completed in 2026 for introduction to schools in September 2027.

This paper provides a context for the redevelopment and has been informed by the views of teachers, school leaders and students gathered through school visits conducted in a representative sample of schools. It begins by considering the background of mathematics with Section 1 presenting an overview of the current context, including consideration of relevant policy developments. Section 2 sets out how mathematics related education is currently provided for within the Irish curriculum before focusing in more detail on Leaving Certificate Mathematics. Section 3 provides an overview of the insights gained through the school visits conducted and the lived experience of schools, teachers, and students. Section 4 considers similar education opportunities internationally and presents an overview of four different jurisdictions. Section 5 draws on the previous three sections to categorise and briefly discuss some issues identified for consideration in the redevelopment of the LC Mathematics curriculum before finally setting out a proposed brief for this work in Section 6, which will guide the work of the development group.

Background and Context

This section sets out some of the significant developments in mathematics education, before focusing on the education and broader policy landscape which are important contextual considerations for the review and redevelopment of LC Mathematics.

The current Leaving Certificate Mathematics syllabus (2013) was introduced into all post-primary schools, on a phased basis, in 2010, under the *Project Maths* initiative; an initiative which began in 2008 to address issues in syllabuses, teaching, learning and assessment of post-primary mathematics highlighted in the *Review of Mathematics in post-primary education* (NCCA, 2005).

This was the first redevelopment of the mathematics curriculum in over twenty years, replacing the previous syllabus which was revised in 1992 and first examined in 1994. The aim of the initiative was to improve the mathematical experience of students in the classroom by retaining and reinforcing the central elements and mathematical rigour of previous syllabuses, while at the same time changing the approach and emphasis in teaching, learning and assessment. *Project Maths* called for more student sense-making, problem solving, engagement in rich learning activities, and conceptual understanding to accompany procedural skills.

Since the introduction of the 2013 syllabus, there have been significant changes in the world of education, mathematics, and beyond. In response to this rapidly changing world, government policies are constantly being developed that prioritise educational goals, informed by these policies the education system is evolving to ensure that young people are adequately equipped for full participation in modern society. A number of government policies, outlined in Table 1, and relevant developments likely to impact the development of LC Mathematics are set out below.

Table 1: Examples of policies and developments since the introduction of the current Leaving Certificate Mathematics (2013) syllabus

Publication	Date	Focus of change and implications for the review of LC Mathematics
Framework for Junior Cycle	2015	The Framework for Junior Cycle (DE, 2015) brought about significant changes in the junior cycle curriculum. • the introduction of key skills across the junior cycle curriculum; • the introduction of classroom-based assessments (CBAs) intended to reduce the focus on the final examination and to increase the prominence given to formative assessment; • the development of Level One and Level Two Learning Programmes (L1LPs and L2LPs) to meet the specific needs of students with general learning disabilities.
JC Mathematics	2018	In line with the Framework for Junior Cycle (2015), a new subject specification for Junior Cycle Mathematics was introduced in schools in September 2018.
LC Computer Science	2021	An opportunity for LC students to study computers and algorithmic processes, in particular • the practices and principles of computer science, such as computational thinking, computers and society, and creative design

		• the analysis of problems in computational terms and understanding concepts such as abstraction, logic, algorithms, computer systems, data representation and evaluation.
LC Applied Mathematics	2021	An opportunity for LC students to develop applied mathematical problem-solving skills so that they will be able to: • Formulate a problem • Translate the problem into mathematics • Compute a solution • Evaluate the solution.
Senior Cycle Review: Advisory report	2021	Set out an agreed purpose for senior cycle education and outlines a vision for the redevelopment of senior cycle that is underpinned by a set of guiding principles. Responding to this report, Minister Foley initiated a programme of senior cycle redevelopment.
International Assessments	2022	Ireland placed 11th out of the 81 countries taking part with Irish 15 years olds scoring significantly above the OECD average for mathematics literacy. Whilst there are consistently fewer students performing in the lower proficiency level categories, the percentage performing at the highest levels remain low and below OECD average.
Financial Literacy in Ireland challenges and solutions	2022	The report on financial literacy by the National Adult Literacy Agency (NALA, Nov 2022) raised concerns over the considerable proportion of adults who experience difficulties using basic mathematics, putting them in a vulnerable position with regard to managing and accessing financial services available. The Department of Finance is currently developing a National Financial Literacy Strategy following OECD recommendations to take *measures to develop financial literacy from the earliest possible age* to help young people *face contemporary financial challenges* (OECD, 2024, p.10). Recommendations included education and training on financial literacy to equip people with the financial knowledge, skills, attitude, and behaviour to achieve financial well-being.
PISA Mathematics Framework	2022	The revised framework highlights the effect global changes in digitalisation and technology have had on the meaning of mathematical proficiency and advises of the need for education to prepare young people to think mathematically so that they will have the skills and confidence to solve the complex problems they will face in the future.
STEM Education Implementation Plan to 2026	2023	The STEM Education Implementation Plan to 2026 (DE, 2023) recognises the important role of mathematics across the curriculum and advocates providing all students with experiences that nurture curiosity, critical thinking, innovation, creativity, collaboration and problem-solving.
Key competencies in senior cycle	2023	A set of key competencies in senior cycle are being embedded across learning outcomes in new and redeveloped subjects and modules. Their introduction is a crucial step towards preparing students to navigate today's ever-evolving world.

Primary Curriculum Framework	2023	Envisages students building on seven key competencies, or interconnected capabilities, which will help them adapt to the range of situations and challenges they may face as they progress through their primary and post-primary education. Situated within this framework, the new Primary Mathematics Curriculum (2023) prioritises its aim to foster mathematical proficiency in students. Through engagement with the curriculum, students will learn to communicate mathematically, be creative, and develop vital skills in the areas of problem-solving, logic, spatial awareness, and the ethical use of digital technology.
Digital Strategies for schools to 2027		The key research findings include a renewed focus on literacy, an increased focus on digital literacy, a need to provide a higher level of challenge for some students, and the recognition that changes in the educational landscape have brought about *a more widespread awareness of the need for students to develop critical thinking, problem-solving, and digital skills (DE, 2024, p.10).*

The curriculum development field has also evolved since the introduction of the 2013 syllabus, with implications for developments in Ireland and internationally. To reflect this, the NCCA have published a comprehensive examination of relevant research and practice on the technical form of curriculum specifications to help decide what format should be used when designing curriculum specifications for senior cycle. This research noted that the technical form of curriculum specifications should reflect the integrated development of knowledge, skills, values and dispositions and align with the key competencies of senior cycle. Further, when developing strands of study, the paper advised that the 'students learn about' column in future senior cycle specifications will offer more detail, with the emphasis on scaffolding of learning outcomes and finding a balance between providing support and avoiding over-elaboration.

Such broad-ranging and dynamic changes mean that the redevelopment of Leaving Certificate Mathematics is now timely and provides an opportunity to ensure that relevant mathematics learning is available to all students in senior cycle.

Section Summary

- The current Leaving Certificate Mathematics syllabus was introduced incrementally from 2008-2013, with the objective to develop mathematical proficiency characterised as: conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition with a new emphasis on the application of mathematics to solve real-world problems.
- National policies provide recommendations that frame the redevelopment of Leaving Certificate Mathematics.
- Research has revealed weaknesses in the basic mathematical competency of a large proportion of adults. Ensuring that all young people have the skills they need for life is an urgent challenge for educators and stakeholders.
- Irish 15 years olds have scored significantly above the OECD average for mathematics literacy, but successive international assessments have revealed that Ireland's higher-achieving students are underperforming relative to higher-achieving students in other countries.
- New policies to promote STEM education and to improve the financial literacy of young people emphasise the importance of cross-curricular applications of mathematics.
- The rate of global changes in technology and society requires educators to reassess the skills that young people will need for the future.
- The growing complexity and unfamiliarity of real-world problems require students to be creative, flexible and able to think mathematically.

Mathematics in the curriculum

This section provides an overview of the opportunities for learning related to mathematics currently available to students within both the junior cycle and senior cycle programmes. It then focuses on the participation rates in Leaving Certificate Mathematics outlining the uptake of the subject and explores the most recent Chief Examiner's report from the State Examinations Commission and the Chief Inspector's report from the Department of Education.

Mathematics in junior cycle

Junior cycle education offers several opportunities for students to learn about mathematics. These opportunities are integrated into various subjects and through specific programs and initiatives.

The Junior Cycle Mathematics specification (2018) replaced the 2016 syllabus introduced as part of the Project Maths initiative. It focuses on developing students' mathematical proficiency for daily life and further studies, emphasising five strands: conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition. The structure includes a Unifying strand and four contextual strands: Number; Geometry and Trigonometry; Algebra and Functions; and Statistics and Probability. Assessment includes two Classroom Based Assessments (CBAs): Mathematical Investigation and Statistical Investigation, in line with the Framework for Junior Cycle (2015).

Most junior cycle subjects provide opportunities for students to model situations and solve problems using mathematics. In JC Science, students gather data and represent it mathematically to draw conclusions. JC Business Studies teaches financial management, consumer behaviour, and economic concepts. Students studying JC Graphics learn about 2D constructions and shapes, how to apply them to problem-solving and develop an understanding of their role in creating 3D objects.

Students can improve their understanding of mathematics through junior cycle education opportunities that are outside the subject domain. Schools may offer short courses like coding. Extracurricular activities, such as Mini Company and competitions like BT Young Scientist & Technology Exhibition and SciFest, help students see the relevance of mathematics to their lives.

Mathematics in senior cycle

Students in senior cycle have opportunities to study mathematics-related subjects and modules across the Leaving Certificate Established (LCE) and the Leaving Certificate Applied (LCA) programme. In Transition Year (TY), schools have a high degree of autonomy in designing their own programme with many opportunities to contextualise mathematics learning in relevant and engaging ways.

Leaving Certificate Established

LC Mathematics

The current syllabus for Leaving Certificate Mathematics aims to help students develop the knowledge, skills and understanding of mathematics necessary to prepare them for their future education, life and work. By teaching mathematics in contexts that allow students to see connections within mathematics, between mathematics and other subjects, and between mathematics and its applications to real life, it is envisaged that students will develop a flexible, disciplined way of thinking and the enthusiasm to search for creative solutions.
Offering continuity from junior cycle, the objectives of Leaving Certificate Mathematics are that students develop the five strands of mathematical proficiency; conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition.

The syllabus comprises five strands: Statistics and Probability; Geometry and Trigonometry; Number; Algebra; and Functions. The syllabus sets out the learning outcomes associated with each strand emphasising that students should be encouraged to make connections across the strands rather than viewing each strand as a topic in isolation. Problem-solving, is defined (page 10) as engaging in a task for which the solution is not immediately obvious and is specified as an essential aspect of the syllabus. The syllabus advocates that problem-solving should permeate all aspects of the teaching and learning experience cutting across each of the five strands. It encourages discussion and collaboration when solving problems, and sharing solution strategies, to support the development of reasoning and justification skills as well as the use of appropriate tasks that create challenges for diverse range of students.

LC Applied mathematics

The Leaving Certificate Applied Mathematics specification aims to develop the students' capacity to use mathematics to model real-world problems. By focusing on all aspects of the problem-solving cycle it is envisaged that students will move beyond calculating procedures and gain experience in asking appropriate questions, formulating mathematical representations of problems, and interpreting and verifying results. Through Applied Mathematics, students should learn to appreciate the extent to which mathematics is relevant in everyday life, generating engagement and interest in the process. It is anticipated that digital technology will be used as a learning tool in some aspects of this course.

There are four strands in Leaving Certificate Applied Mathematics: Mathematical modelling, Mathematical modelling with networks and graphs, Mathematically modelling the physical world, and Mathematically modelling a changing world. Mathematical modelling underpins applied mathematics and so is considered a unifying strand; it permeates all the strands of the specification.

Transition Year

In the Transition Year Programme Statement (2024) Mathematics is one of the five core components. The focus on continuity and progression in Transition Year (TY) allows students to build upon their learning at junior cycle in parallel to developing aspects of the key competencies of senior cycle. In particular, the mathematics component will provide opportunities to nurture the competencies of Thinking and Solving Problems, Being Creative, Communicating, and

Working with Others. TY also offers time for students to explore mathematics in the real world, raising awareness of future career paths which can help them make informed choices regarding their future career options.

With digitalisation in education systems expanding globally, students will have opportunities to upskill in collaborative environments and experiment with unfamiliar technologies. The flexibility of the TY programme allows students to become agents of their learning, to grow and develop personally, to make a positive contribution to local communities, to discover learning strategies that suit them best, and to partake in meaningful and enjoyable activities that foster creativity. The autonomy embedded in the TY programme provides opportunities for teachers to adopt innovative approaches to teaching mathematics that have the potential to be transformative for student motivation.

Mathematics in focus

This section explores participation rates in Leaving Certificate Mathematics drawing on statistics from the State Examinations Commission (SEC). It also provides an overview of assessment for certification and some insights into student engagement with different areas of the current Leaving Certificate Mathematics syllabus based on recent reports from the SEC and Department of Education.

Student participation

The table below provides an overview of the students sitting the Leaving Certificate Established Mathematics examination since 2019. Approximately 36% of candidates taking Mathematics took the examination at Higher level in 2024; in 2019 the percentage uptake at Higher level was 33%. From 2012 students achieving a grade HD3 and above (H6 since 2016) received an additional 25 bonus points in their leaving certificate. The number of students taking Higher level in 2011, before the bonus points were introduced, was 8,325 which equated to 15.8% of the candidates taking mathematics. No CAO points are awarded for achievement at Foundation level.

Year	Higher Level	Ordinary Level	Foundation Level	Total Candidates	Total LC candidates	Mathematics as a % of total candidates for LCE
2019	18,153	31,474	5,467	55,094	56,071	98.3
2020	20,520	33,862	2,602	56,984	57,569	98.9
2021	22,919	32,319	2,065	57,303	57,952	98.9
2022	21,265	32,792	3,290	57,347	58,056	98.8
2023	20,516	33,220	3,612	57,348	58,006	98.9
2024	20,330	32,362	3,332	56,024	56,791	98.6

Table 2: Number of students sitting Leaving Certificate Mathematics at higher, ordinary and foundation level 2019-2024

Assessment for certification

Leaving Certificate Mathematics is assessed by a terminal written examination. Differentiation at assessment is achieved through examination at three levels — Foundation level, Ordinary level and Higher level. There are two papers at Higher and Ordinary level and one paper at Foundation level, all papers are two and a half hours in duration.

Insights from Chief Examiner's Report

The most recent Chief Examiner's Report for Mathematics (SEC, 2015) was published after the examinations in 2015. It was noted that this was the first year the new syllabus was fully examined so may not reflect the effect of the new syllabus on teaching and learning. However, the report does provide insights into areas of mathematical proficiency that have been further highlighted in more recent inspection reports outlined below. The report expresses concern about the overall performance of some students sitting the Higher level paper in the application of basic skills, particularly those at the lower end. A significant minority of these students found the higher-order thinking skills difficult and struggled with multi-step procedures. Concern is also expressed that many students sitting the Ordinary level paper displayed a lack of knowledge of standard procedures and a lack of perseverance. Questions requiring the students to make connections between different strands of the syllabus caused difficulty for many.

The report emphasises reintroducing and reinforcing junior cycle skills, which had not been grasped at Ordinary level and Foundation level and were preventing the progress of mathematical proficiency in other areas. Teachers are encouraged to provide more opportunities for students to apply their skills and knowledge across the five strands, to be exposed to unfamiliar questions and to develop multiple strategies for solving questions.

Insights from Chief Inspector's Report

During the period 2016 to 2020, inspectors' overall findings with regard to the quality of teaching and learning in mathematics have been very positive. The Inspectorate reported that the more student-centred approaches promoted by revisions to the mathematics syllabus over the last decade are now resulting in more engaging teaching practices in most classrooms.

Levels of experiential and constructivist learning
Inspection reports point to improving levels of experiential learning in lessons and an increasing emphasis on constructivist approaches to the introduction of mathematical concepts which allow students to become active participants in their learning. Inspectors advised that teachers dedicate a higher proportion of lesson time to active learning, where students are provided with opportunities to collaborate, hypothesise and engage in, and persevere with, increasingly difficult tasks.

The use of assessment to support learning in mathematics
Inspectors pointed to a need for enhanced formative feedback on students' work, the further development of questioning strategies that require students to explain their thinking, and greater use of peer and self-assessment. It was also noted that there was a need for greater cross-curricular planning so that links between mathematics and other subjects were identified and used to create integrated learning opportunities.

Performance in international assessments

Overall, Irish students performed very well in mathematics in international assessments, however, some of the findings point to significant challenges for the teaching of mathematics in Irish post-primary schools. Students in Ireland were significantly above the OECD average in mathematics but the percentage of students performing at higher proficiency levels was 8.2% compared to the OECD average of 10.9%. This relative underperformance was also highlighted in the last *Chief Inspector's Report* which was published in 2016. A further concern from the *PISA* assessment of 2018 was students' underperformance in test items that required students to apply mathematical skills in dynamic, problem-solving environments. Given the importance of mathematical skills in areas that are likely to be increasingly economically significant, as well as the importance of mathematics as a tool in everyday life, the relative weakness of Irish students in applying mathematical concepts and skills should be addressed in curriculum design, teacher education and practice, Inspectorate evaluations and within state examinations.

Section Summary

- The specification for Junior Cycle Mathematics (2015) provides continuity with Junior Certificate Mathematics in its aim to foster mathematical proficiency to support a deeper understanding of mathematics.
- The introduction of a Unifying Strand in the junior cycle specification is intended to encourage students to make connections between the four contextual strands. By seeing mathematics as a body of interconnected ideas students should be better prepared to deal with the more abstract mathematics in the senior cycle.
- In line with the Framework for Junior Cycle (2015), Junior Cycle Mathematics stresses the importance of assessment as part of teaching and learning. This is supported by two Classroom Based Assessments (CBAs): CBA 1 – Mathematical investigation; and CBA 2 – Statistical investigation.
- Leaving Certificate Mathematics, taken by more than 99% of students of Leaving Certificate Established, is offered at Higher, Ordinary and Foundation Levels. The learning outcomes of the Ordinary level are a subset of the Higher level, allowing for differentiation and to facilitate students to move to Ordinary level if they find Higher level too challenging.
- The Chief Examiner's report expresses concern at the performance of students at both Higher and Ordinary level in applying the basic skills of mathematics and their ability to make connections between the different strands on the syllabus. It recommends exposing students to unfamiliar questions and multi-solution strategies to enhance their understanding.
- Department of Education inspection reports have highlighted areas of teaching and learning that enhance mathematical proficiency and areas that are leading to rote learning without understanding. Concern was raised over the relative underperformance of students at the higher proficiency level and the relative weakness of Irish students in applying mathematical concepts and skills.

Insights from school visits

School visits were conducted as part of the scoping work for this Background Paper. The representative sample was selected from the 63 schools that expressed an interest in becoming involved in Leaving Certificate Mathematics curriculum developments. The six schools were selected using criteria relating to DEIS status, gender, school size and type. Visits to these schools took place in September and October 2024 and involved focus group meetings with 50 senior cycle students, 31 Leaving Certificate Mathematics teachers and 15 school leaders. The following section provides an overview of the insights gathered through these visits.

Opportunities and challenges

When discussing the opportunities and challenges they faced in realising the aim of LC Mathematics in their classrooms the focus on problem-solving, using contexts that allow students to make connections within mathematics and to see the relevance of mathematics in their lives were identified as opportunities. In maximising these opportunities, timing, the breadth of the course and the diverse range of abilities of students progressing from junior cycle were seen as the biggest challenges. Teachers reported feeling constrained in using student centred methodologies that allow collaborative working which was having a negative impact on the realisation of the syllabus aims and objectives, in particular the ability to make connections within mathematics and the development of strategic competence, adaptive reasoning and productive disposition. While the importance of understanding the language of mathematics and mathematics in context was acknowledged there was a perception that the breadth of the course and the diverse range of abilities of students left insufficient time to ensure all students were adequately prepared for the contextualised questions in the examination. This is leading to anxiety, lack of confidence and frustration.

Breadth of the syllabus

Whilst teachers could see the importance of all topics on the current syllabus, there was unanimous agreement that the syllabus at both ordinary and higher level is too long. There was no consensus, however, as to what should be removed to allow for what is seen as a necessary deeper level of engagement. The diverse range of students mean considerations about removal of content are challenging, particularly given the importance attached to ensuring that all students are suitably prepared for their post-school pathways. Suggestions were made that priority for removal should be given to topics that encouraged rote learning; constructions, proof by induction and proof by contradiction were noted in that regard, or those that required an understanding too advanced for students at post-primary level, such as trigonometric and geometric proofs. Making mathematics relevant to students' lives was seen as a priority for a redeveloped specification, in this regard, suggestions were made to remove topics such as mortgages in financial mathematics and complex numbers. In all focus groups, there was a strong consensus that a solid understanding of statistics was essential for life although there was disagreement over the depth to which it needs to be studied in school.

Providing space to engage with calculus and algebra in a meaningful way at higher level was emphasised given its foundational importance for third level, however its relevance at ordinary level was questioned. There is a perception that the ordinary level specification should be more of

a functioning maths programme– preparing students to function in society with a practical relevant application.

Progression from junior cycle

Students reported a perceived gap between junior cycle and leaving certificate mathematics in relation to the level of difficulty in the content and the pace at which the classes progress. They suggested that 5th year should be a time to reinforce, and gradually extend, concepts experienced in junior cycle to make the transition easier. Students reported that it has become very common to get extra tuition, outside of school, to keep with pace and level of challenge of the classes at higher level. For many students they considered this support to be a necessity to enable them to study at higher level.
Both teachers and students noted that students struggled to make connections between concepts and were relying on the text book or the teacher to link the topics together.

Bonus points

The issue of bonus points came up for much discussion and teachers and management were unanimous in their belief that the lure of bonus points was leading to many students opting to study at higher level against the advice of their teacher. This has skewed the range of abilities in both higher and ordinary level mathematics classes which has presented challenges, particularly at higher level. One common challenge is matching the pace at which to progress lessons to the pace at which students can progress their learning, and still complete the course. This can result in some students feeling overwhelmed and others left frustrated.

Foundation level mathematics

Whilst none of the schools visited had a dedicated Foundation level class, each school had a number of students who sat the Foundation level examination each year. Entry at this level was in most cases a last minute decision by students whose attendance was poor or who teachers felt were unprepared for success at ordinary level.

Suggestions for a redeveloped mathematics specification

Students and teachers were unanimous in their belief that providing time and space in a redeveloped specification for students to discuss mathematics with their peers would support their problem-solving ability which was likely to increase their overall mathematical proficiency. There were suggestions that there should be a more clearly defined problem-solving strand embedded in the specification and that empowering students to accept that making mistakes is an essential part of the learning process should be considered as an aim.

When asked what competencies were considered important for students to develop in mathematics class, confidence, problem-solving, collaboration and discussion, creativity, perseverance, and mathematics skills necessary for life were all cited as essential. Participants cited activities that required students to share and justify solution strategies to problems as ideal collaboration scenarios and noted that while collaboration is considered to be important, there should be a balance between working with others and independent learning. A modular approach where all students engage with core concepts and later have the autonomy to choose topics they might need for life beyond school was suggested in several schools. Students were supportive of this approach and whilst management and teachers acknowledged the challenges it might present it was felt its consideration should not be dismissed given the advantage it could offer students. In this regard, the suggestion was to develop a specification that identifies core mathematics skills

that all students should have when they leave school, the mathematics considered essential for life, then provide options, mathematics considered essential for apprenticeships and more advanced options for those needing mathematics for further or higher education.

All participants were in agreement that retaining the rigour for those passionate about mathematics and ensuring every student had the mathematics they needed for life should be the priority.

Assessment

The introduction of an AAC was welcomed as an opportunity for students to secure 40% in advance of the written paper and as a motivator for students in 5th year. Participants noted the importance of aligning the assessment closely with the learning set out in the specification and felt that the AAC should assess learning that could not be assessed in the written examination. Whilst concerns were raised about how AI might impact on equity and the completion of an AAC it was agreed that clear guidelines would need to be given on the role of the teacher and the process of authenticating student work. When discussing the nature of an AAC, there was support for the junior cycle CBAs in theory but most felt that there would need to be much more clarity over what exactly the AAC would be assessing. Clear language and student choice were considered essential aspects for any AAC to enable students to take ownership of their work and to ensure equitable access for all students. Teachers disagreed on the exact nature of an AAC but welcomed the opportunity afforded by an AAC to assess learning not easily assessed in a written paper and felt it needed to be integrated into the teaching and learning rather than being an additional piece of work.

Use of technology

There was consensus that the current syllabus did not promote the use of digital technology which resulted in its use varying from school to school and within schools. Students reported that using technology in class helped them visualise and understand concepts and they would like to see it explored further. Geogebra was cited as an excellent tool that could be exploited more but its widespread use would require specific training. Teachers were generally enthusiastic about exploring other technologies and engaging pedagogies in a redeveloped specification but cautioned that its integration would need to be resourced with time and investment.

Section Summary

- There is a significant increase in the pace of teaching and learning as students progress from junior cycle to senior cycle. This coupled with the level of difficulty was seen as a considerable challenge for 5th year students at all levels.
- Teachers and students are challenged by the breadth of both the higher and ordinary leaving certificate courses. Teachers feel constrained in their approach, and students report feeling that their learning is rushed.
- When discussing pedagogy, collaboration and discussion were acknowledged as important for consolidating understanding and developing problem-solving skills.

- Providing opportunities to engage in discussion with peers would most likely support the development of mathematical proficiency.
- Topics included in a redeveloped specification should focus on student needs - both the mathematics required for further and higher education and the mathematics that all students needed for life.
- Students at ordinary level are best served by mathematics that is relevant to their lives.
- Topics that build student confidence, and help foster collaboration, creativity, exposure to uncertainty and resilience should take priority over topics that encourage rote learning.
- The introduction of the AAC was welcomed by students and is seen as an opportunity to work on a topic of interest to them and as a means of reducing the reliance on the final written examination.
- The redevelopment presents an opportunity to embed technology in the teaching and learning of mathematics, but this would need to be resourced appropriately.

International trends in Mathematics education

This section looks at Mathematics in the Hong Kong Diploma of Secondary Education Examination, in the international IB Diploma Programme, in the National Certificate of Educational Achievement in New Zealand, and for GCE A Level Mathematics in Singapore. It briefly covers the place and purpose of the study of Mathematics in the senior secondary phase and provides a short overview of curriculum content and how the subject is assessed.

In other jurisdictions, the area of mathematics offers specialist options for students to choose from depending on their post-school aspirations. In Queensland, pathways allow students to select from five different mathematics courses at senior secondary. In British Columbia the mathematics curriculum offers seven courses at grade 12 to provide essential mathematics for life along with more academic options. In Ontario, in Grades 11 and 12 there are nine different courses available.

Mathematics in the Hong Kong Diploma of Secondary Education Examination (HKDSE)

Context

School students in Hong Kong take the Hong Kong Diploma of Secondary Education Examination (HKDSE) on completion of six years of secondary education, at around age 18. Mathematics is a core subject for the HKDSE, and most students take four core subjects (Chinese Language, English Language, Mathematics (Compulsory Part), and Citizenship and Social Development), plus two to three elective subjects.

Mathematics in the HKDSE aims to help students acquire the ability to explore, conjecture and reason logically and provides a foundation for the study of other disciplines. In developing students' ability to conceptualise, inquire, reason, communicate, formulate and solve problems mathematically, and their capability to appreciate the aesthetic nature and cultural aspects of mathematics, it also plays an important role in helping develop skills for lifelong learning.

Curriculum

The Mathematics Education Key Learning Area curriculum framework includes subject knowledge organised under strands, generic skills, and values and attitudes, setting out what students should learn and develop in the Mathematics Education KLA. There are three strands in the compulsory senior secondary Mathematics Education curriculum - Number and Algebra, Measures, Shape and Space, and Data Handling. To cater for students who have different needs, interests and orientations, the senior secondary mathematics curriculum also includes an Extended Part. This is designed for students who need more mathematical knowledge and skills for their future studies and careers than is provided in the Compulsory Part of the curriculum. Students choose whether to take the Compulsory Part only or the Compulsory Part plus one of the two modules of the Extended Part:

Module 1. Foundation Knowledge, Calculus, and Statistics and emphasises applications rather than mathematical rigour. It provides students with intuitive concepts of calculus and statistics.

Module 2. Foundation Knowledge, Algebra, and Calculus, and emphasises understanding of mathematics for further progress in mathematically inclined disciplines.

Key Stage		No. of hours (over 3 years)
KS4 (S4-6)	Compulsory Part	250 – 313
	Compulsory Part with one module	375

Table 3: Time allocation for the implementation of the mathematics curriculum at secondary level in the Hong Kong Diploma

Assessment and Recognition

For mathematics, assessment is via external examinations in accordance with the assessment framework for HKDSE Mathematics which is published online. Examinations are set and marked by the Hong Kong Examinations and Assessment Authority (HKEAA). Student performance is reported at one of five levels (1—5), with 5 being the highest. For entry to local tertiary institutions, HKDSE students have to achieve at least a level 2 for Mathematics Compulsory Part to meet the minimum requirements for undergraduate programmes.

IB Diploma Programme Maths

Context

The International Baccalaureate (IB) Diploma Programme (DP) is a two-year pre-university course for students aged 16 to 19. Students study six or seven subjects: two languages, a humanities or social science subject, an experimental science, mathematics, and either one of the creative arts subjects or two subjects from another academic area. Students usually take three (of their six or seven) subjects (and not more than four) at HL; the others are taken at SL.

Students select one mathematics course for their Diploma Programme from a choice of four:

- Mathematics: analysis and approaches SL (standard level) or HL (higher level)
- Mathematics: applications and interpretation SL (standard level) or HL (higher level)

Curriculum

The two different DP Mathematics courses are designed to suit particular students' different needs, aspirations, interests and abilities:

1. **DP Mathematics: analysis and approaches** recognises the need for analytical expertise in a world where innovation is increasingly dependent on a deep understanding of mathematics. The focus is on developing important mathematical concepts in a comprehensible, coherent and rigorous way.
2. **DP Mathematics: applications and interpretation** recognises the increasing role that mathematics and technology play in a diverse range of fields in a data-rich world. The course includes topics that are traditionally part of a pre-university mathematics course such as calculus and statistics.

Problem-solving is also central to learning mathematics in both DP mathematics pathways and involves the acquisition of mathematical skills and concepts in a wide range of situations, including non-routine, open-ended and real-world problems.
All DP mathematics courses also require students to appreciate the use of technology in mathematics and to become proficient with graphic display calculators.

Course Level	Syllabus content	No. of hours (over 2 years)
SL	Number and algebra; functions; geometry and trigonometry; statistics and probability; calculus	120
	Investigation, problem-solving, modelling and exploration topic	30
HL	Number and algebra; functions; geometry and trigonometry; statistics and probability; calculus	210
	Investigation, problem-solving, modelling and exploration topic	30

Table 4: Time allocation for the implementation of the mathematics curriculum at secondary level in the IB Diploma

Assessment and Recognition

The IB Diploma Programme is assessed via external examination papers. The SL has two papers and the HL has a third paper on extended-response problem-solving questions. The IB approach to assessment is criterion-related, not norm-referenced, judging students' work by their performance in relation to identified levels of attainment, not in relation to the work of other students.

For both SL and HL students there is an internally assessed exploration carrying 20% of the total marks. The exploration, which is intended to take 10 to 15 hours, is an integral part of the course and its assessment and is compulsory for all students. It aims to enable students to demonstrate the application of their skills and knowledge, and to pursue their personal interests, without the time limitations and other constraints that are associated with written examinations. It involves investigating an area of mathematics, and the emphasis is on mathematical communication (including formulae, diagrams, graphs, tables etc).

New Zealand

Context

Mathematics and Statistics is an approved subject for university entrance in New Zealand and, as with other subjects, students choosing it as one of their three approved subjects for the NCEA must achieve 14 credits in the subject at Level 3 (the level usually achieved in the final year of senior secondary education, Year 13).

Curriculum

The Achievement Objectives for Mathematics and Statistics for the (80-credit) National Certificate of Educational Achievement (NCEA) (the senior secondary qualification) are given at 8 different levels. Mathematics and Statistics in the NCEA is based on five 'Big Ideas' which combine with 'Significant Learning' to form a Learning Matrix. The nature of Mathematics and Statistics as a subject means that aspects of Significant Learning often cross over multiple Big Ideas. The five Big Ideas are:

1. Critical thinking, and mathematical and statistical generalisations emerge from the linking/ connection of different observations, knowledges, and processes.
2. Experimentation and exploration allow for elegance, creativity, and exploration of mathematical and statistical ideas.

3. In Mathematics and Statistics, sharing and exploring knowledge stimulates logical argument, investigation, analysis, and justification, supporting critical evaluation and reasoned conclusions.
4. Mathematical and statistical concepts, patterns, and relationships can be represented in multiple ways.
5. Mathematical and statistical methods can be used to explore, solve, or model problems while recognising variation, certainty, and uncertainty.

In line with the Learning Area Structure for Mathematics and Statistics, achievement objectives are also presented in three strands: Number and Algebra, Geometry and Measurement, and Statistics. Students are expected to be able to see and make sense of the connections within and across these strands.

Assessment and Recognition

Students choosing Mathematics and Statistics as one of their three approved subjects for university entrance for the National Certificate of Educational Achievement (NCEA) achieve their 14 Level 3 credits from a variety of internally and externally assessed Achievement Standards. At Level 3 of the NCEA there are 15 Achievement Standards for Mathematics and Statistics, nine of which are internally assessed; six are externally assessed (three for Mathematics (Calculus) and three for Statistics). In the external assessment, problems are set in real-life contexts and are via examinations set by the New Zealand Qualifications Authority (NZQA). The examinations are available in paper format only. That said, the NZQA is moving towards offering all external assessments as digital. Conditions of Assessment also provide guidance to teachers on appropriate ways of, and conditions for, gathering evidence for the internally assessed standards, and ensuring that evidence is authentic.

For externally assessed Achievement Standards in Level 3, Calculus and Statistics, the Assessment Specifications set out that students must bring an approved calculator, preferably a graphing calculator, for the examination, and that students who do not have a graphing calculator will be disadvantaged. The Specifications set out also that students are required to demonstrate an understanding of mathematical concepts when giving results.

Singapore

Context

The Singapore-Cambridge General Certificate of Education Advanced Level (GCE A-Level) is a two-year course, closely aligned to the Singapore school curriculum. Students can opt to be examined on subjects at three levels of study – Higher 1 (H1), Higher 2 (H2), and Higher 3 (H3). H3 subjects are taken as an extension to H2 level and allow more in-depth study and advanced content. Students normally take three content-based GCE A Level subjects at H2 level, one content-based subject at H1 level, the mother tongue language at H1 level, and the General Paper (GP) at H1 level. They also complete Project Work at H1 level. They must take at least one of the four content-based subjects from a contrasting discipline, and academically strong students may choose to study an additional H1 or H2 subject or up to two H3 subjects. GCE A Level subjects are divided into knowledge skills and content-based subjects. Knowledge skills subjects include the General Paper, Knowledge and Inquiry, and Project Work, and content-based subjects are divided into the areas of languages; humanities and the arts; and mathematics and sciences.

Curriculum

The Mathematics GCE A Level H2 syllabus is designed to prepare students for a range of university courses, including mathematics, sciences, engineering and related courses. It develops mathematical thinking and reasoning skills that are essential for further learning of mathematics. Through applications of mathematics, students also develop an appreciation of mathematics and its connections to other disciplines and to the real world. H3 Mathematics provides students who intend to pursue mathematics at university with an insight into the practice of a mathematician and equips them with the knowledge and skills to understand and write mathematical statements, proofs and solutions. H1 Mathematics provides students with a foundation in mathematics and statistics that will support their business or social sciences studies at university.

Assessment and Recognition

The Singapore Cambridge GCE A Level is conducted jointly by the Singapore Ministry of Education (MOE), the Singapore Examinations and Assessment Board (SEAB) and the University of Cambridge Local Examinations Syndicate (UCLES), and assessment for the GCE A Level in Mathematics is external. The Mathematics GCE A Level (H1, H2 and H3) assesses students' ability in relation to three Assessment Objectives (AOs): AO1 Use mathematical techniques and procedures; AO2 Formulate and solve problems including those in real-world contexts; AO3 Reason and communication mathematically.

Section summary

- Many of the jurisdictions explored, provide flexible routes throughout their upper secondary school mathematics programme, supporting students to make choices in their mathematics learning that reflect their interest and post-school aspirations.
- Many jurisdictions provide learning opportunities that provide specific learning in mathematics necessary for industry and the workplace, and for college or university courses.
- There is a consistent focus on the development of students' attitudes towards problem solving and the work of a mathematician. In addition, many jurisdictions focus on the application of learning and making connections to the real world.
- Developing critical thinking, reasoning, and mathematical communication skills have a significant role in all jurisdictions.
- In most of the jurisdictions explored there is an emphasis on the importance of using technology to enhance conceptual understanding.
- Assessment is multi-faceted with a focus on a range of assessment modes with a balance in many cases between school-based and external assessment.

Issues for Consideration

This section sets out several issues for consideration in developing a new specification for Leaving Certificate Mathematics. These arise from the nature of the subject itself, in addition to drawing on themes emerging in the previous sections of this background paper.

Appropriate continuity and progression

Schools report that teachers' biggest challenge is managing the diverse range of abilities of students progressing from junior cycle, which affects their ability to teach mathematics concepts effectively. This is worsened by the perceived difficulty gap between junior cycle and Leaving Certificate mathematics, and the distribution of student abilities at higher level due to an increase in the number of students following the HL course since CAO bonus points were introduced. Redeveloping the subject should consider the rationale for Leaving Certificate mathematics and ensure the specification at each level offers suitable engagement opportunities. It should also encourage students to choose the appropriate level that realistically challenges them and prepares them for future pathways.

Nature of the mathematics specified at each level

Many jurisdictions offer mathematics education in upper secondary that are tailored for progression to technical and vocational learning, higher education, and workplaces. In this regard, deliberations should carefully consider the mathematical content specified at each level and the relationship between each of the levels. For example:

- Could foundation level and ordinary level focus on practical mathematics relevant to students' lives, leaving higher level as a standalone course preparing students for mathematically intensive post-school pathways?
- To what extent should the content of the ordinary level curriculum relate to the higher level curriculum?
- What are the implications of such design choices on the appropriateness of the curriculum to the needs, aptitudes and interests of students opting to study at each level?

The nature of assessment and its integration with teaching and learning

A variety of assessment approaches are evident across the international jurisdictions which assess abilities such as using mathematical techniques and procedures; formulating and solving problems including those in real-world contexts and reasoning and communicating mathematically.
The insights from school visits point to the benefits of the AAC in allowing students to pursue their interests, showcase their learning, and use mathematics developed over the course of study. Deliberations related to the nature of the AAC will need to carefully consider:

- The identification of learning that cannot be assessed in the final written examination that would merit a weighting of 40%.

- How to effectively integrate assessment with teaching and learning, as teachers plan to progressively develop students' competencies as mathematicians, whilst meeting the learning in the learning outcomes of the specification.
- The impact on course structure, student motivation, and the movement between levels given its completion at the end of 5th year.

Digital technology and the role of IT

Technology is a feature of learning and assessment in mathematics across the international jurisdictions. There is an acceptance that technology has the potential to support the development of mathematical proficiency and teachers in the focus group schools have expressed a willingness to explore this potential. Deliberations will need to consider the role of technology in a redeveloped specification and the associated resourcing implications.

Policy alignment

Following the Minister's announcement in March 2022, work has progressed to remove barriers between programmes. For example, students following the LCA programme can now access LCE mathematics. As the proposals on senior cycle pathways progress in parallel to the redevelopment of LC Mathematics, it will be important to monitor whether access to the existing LCA Mathematical Applications module will be made available to all students so that the potential implications for the OL and FL curriculum can be considered at the earliest opportunity.

Section Summary

- In the redevelopment of Leaving Certificate Mathematics, it is imperative to respond to the diverse range of abilities of students progressing from junior cycle
- Careful consideration needs to be given to:
    - The rationale of the subject and the breadth of learning specified at each level.
    - The nature of the mathematics learning specified at each level and the relationship of the levels to each other.
    - The nature of the AAC so that it can be completed towards the end of 5th year, is deserving of its weighting whilst adequately assessing the key learning that cannot be assessed by a written examination.
    - The role of technology in a redeveloped specification.
    - Policy developments related to senior cycle pathways.

Brief for the review of Mathematics

NCCA has established a development group to undertake the task of redeveloping a curriculum specification for Leaving Certificate Mathematics. The work of the Development Group is, in general terms, agreed by the NCCA Board for Senior Cycle and by the Council in the form of the brief set out below.

This brief is designed to provide the basis for redeveloping Leaving Certificate Mathematics. While the brief is derived from the key insights and issues for consideration identified in the previous sections of this paper, it is also guided by the parameters for the design of assessment arrangements in the development of specifications for all Tranche 3 subjects (Appendix 1).

The specification will be student-centred and outcomes-based and in general terms, the specification should be broadly aligned with levels 4 and 5 of the National Framework of Qualifications. It will be available at both Higher and Ordinary level, and it will be designed to be taught and assessed in a minimum of 180 hours.

The specification will align to the template, agreed by Council, for curriculum specifications as set out in the *Technical form of curriculum specifications for subjects and modules in a redeveloped senior cycle* (NCCA, 2023). The Senior Cycle Key Competencies will be embedded in the learning outcomes.

The specification will be completed for Q1 2026.

More specifically, the development of the new specification for Mathematics will address:

- How the specification aligns with the guiding principles of senior cycle and the vision for senior cycle education
- How the specification can support continuity and progression, including how to connect with and build on related learning at junior cycle, in the Transition Year and in other senior cycle subjects and modules
- How the specification can prepare students for future learning in life, study, entrepreneurship and further education and training, higher education, apprenticeships, traineeships, and work
- The rationale for Leaving Certificate Mathematics, making it transparent and evident to students, teachers, and parents
- How the specification, in its presentation and language, can be strongly student-centred and have a clear focus on how students develop and demonstrate their knowledge, skills, values and dispositions
- How the specification, in its presentation, can support teachers in planning for teaching, learning and assessment

- How the specification can support the development of senior cycle key competencies including those relevant to Mathematics such as Thinking and solving problems, Communicating, Working with others and Being creative
- How differentiation can be embedded into the specification to adequately support the diversity of students in teaching, learning and assessment
- How the specification can support the development of numeracy, literacy and a range of digital skills relevant to future life, work, and study
- The nature of the learning specified at each level so that those students needing essential mathematics skills for life and those needing more academic mathematics are all adequately catered for
- How to develop assessment arrangements for LC Mathematics that are aligned to the parameters for the design of assessment arrangements in the development of specifications for all Tranche 3 subjects (Appendix 1)
- How the AAC can support and extend the agency of teachers and students, offering choices that support the inclusiveness of the curriculum
- The need to address the concerns of teachers over the relationship between the AAC and everyday classroom teaching by integrating the AAC into normal classroom practice
- How the introduction of the 40% assessment component necessitates a review of the course requirements to reduce pressure on students whilst maintaining essential mathematics for life in addition to the more advanced concepts and skills required for further and higher education.

The work of the Development Group will be based, in the first instance, on this brief. In the course of the work and deliberations of the Development Group, elaborations of some of these points and additional points may be added to the brief.

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Appendix 1: Overarching parameters for the design of assessment arrangements in the development of specifications for all Tranche 3 subjects.

1. **Executive summary**

- The Minister for Education announced an update on September 20, 2023, on the approach to be taken to the introduction of new and revised subject specifications including how assessment would be addressed in those specifications. Specifically, each subject shall have an assessment component in addition to the final written examination.
- This assessment component (an AAC) will be worth at least 40% of the total available marks.
- Each subject is to have one written examination; typically marks for the written examination will be 60%,
- Typically, there should be two assessment components: One written examination and one other assessment component (an AAC).
- More than one AAC or written examination may be justified in exceptional circumstances and after extensive consideration of the overall assessment load on students. Such exception, however, would be based on strong, clear evidence that a second AAC or a second written paper in the final examination is essential to assess student learning which cannot be achieved through a single AAC and a single written examination paper.

2. **Introduction**

This document outlines the overarching assessment arrangements and parameters to guide the design of specifications for all Tranche 3 subjects which include:

- Agricultural Science
- Computer Science
- Design and Communication Graphics
- History
- Home Economics
- Mathematics
- Music
- Physics and Chemistry.

This advice is informed by ongoing work with Tranche 1 and 2 subjects and will be amended, as appropriate, for future tranches which may take account of their subject areas and existing assessment arrangements.

The arrangements as detailed here reflect the policy direction issued by the Minister of Education that all subjects will have an assessment component, to be in a form that is not a traditional written examination, for those components to be set and assessed by the SEC and thereby lead to a reduced emphasis on final examinations in June of 6th year.

Specifically, the arrangements for all assessment components as outlined in this document are framed by the Minister's announcement(s) on March 29, 2022, and subsequently on September 20, 2023. Underpinned by the following understandings, the assessment components:

- will not take the form of traditional written examinations.
- will be set and marked by the SEC.

- will be subject to SEC arrangements for their completion, authentication, and submission.

In developing the arrangements outlined below, the following rationale for moving towards all subjects having another assessment component is central. This rationale is informed by deliberations on research commissioned by the NCCA and the SEC, and on the assessment literature more generally. From this work, it is evident that these components have the potential to:

- **Reduce dependence** on written summative examinations and therefore provide for a **broader assessment system**; written examinations have an important role but can be seen as a 'snapshot' of learning and can lead to teaching and learning having an excessive focus on examination preparation; other forms of assessment can mitigate the potential for this narrowing of learning by assessing aspects of student learning better and/or more comprehensively than written examinations alone can do; or assess learning that is not readily assessable through written examinations.
- Support and enhance teachers' understanding and assessment of **key competencies** by contributing to a greater understanding of how students' knowledge, skills, values, and dispositions are assessed.
- Provide opportunities for students and teachers to **reflect on student learning,** boost students' motivation to learn and enhance opportunities for formative feedback practices.
- Extend the range and diversity of assessment opportunities; including **spreading the assessment load** over the course of the last two years of senior cycle and thus contribute to a reduction in or spreading of pressure on students.
- Build and develop **teachers' assessment skills and assessment literacy** as teachers support students in working through the assessment activities as detailed within assessment briefs or guidelines.
- Generate student assessment data which can help reduce the vulnerability of the system to future unprecedented or unexpected system shocks such as COVID.
- Allow for assessment opportunities that are more **authentic** than a system relying on terminal written examinations solely.

It is also important to note that a review of the assessment literature more generally also indicates that when introducing other assessment components, it is necessary to consider how to mitigate risks, for example, of:

- over-assessment of students
- over-rehearsal of assessments
- the assessments becoming overly structured, compartmentalised, repetitive, and routine.

As is already the case where other forms of assessment apply, the new assessment arrangements will be guided by the overarching principles of equity, fairness, and integrity.

In addition, at a programme wide level (i.e. taking account of all subjects and modules implemented across schools), it is necessary to have regard to the overall assessment load on students primarily as well as on schools more generally. Whilst it can be expected that SDGs might focus on the approach to assessment in their own subject initially, they are encouraged to be mindful of the overall assessment load across all subjects and modules. Such programme level considerations will also include the methods of assessment being undertaken. As stated above

more than one AAC or written examination may be justified in exceptional circumstances and the following section outlines the process for such cases.

3. Process

This section sets out the process through which a variation to the parameters defined in this document will be considered and decided upon; for example, an additional AAC or a second final written examination.

1. Following extensive discussion by the SDG and after exploration of a range of options for a single suitable AAC/single written examination for the subject, the NCCA Executive generates a written note setting out the strong, clear case being made by the Development Group.
2. The written case is agreed and signed off by the Development Group.
3. The written case is discussed with the Board for Senior Cycle.
4. The written case is discussed with the Council. On foot of this discussion, the Council decides whether or not to send the case forward to the Department.

a) Having considered the importance of managing and spreading the assessment load for students, if the Council decides that the case isn't sufficiently strong to merit consideration by the Department, the Council requests the Development Group to work on the basis of one AAC and one written examination.

OR

b) Having considered the importance of managing and spreading the assessment load for students, if the Council decides that the case is sufficiently strong to merit consideration by the Department, the Council agrees to send the case forward to the Department of Education.

5. In the case of 4b, the written case is sent to the Senior Cycle Redevelopment Programme Management Office (SCRPMO) in the Department of Education for consideration and response.
6. The Department may convene the Senior Cycle Redevelopment Implementation Group (SCRIG) to support its consideration of the request for a variation. The SCRIG is a Department-led structure established to provide oversight and support the co-ordination of work across the key agencies/organisations contributing to the redevelopment of senior cycle. Its members include senior officials from the Department (Curriculum and Assessment Policy Unit, Inspectorate, Teacher Professional Learning [TPL]), NCCA, SEC and Oide.
7. The Department decides to support or decline the request for the variation sought and communicates its decision in writing to the NCCA in a timely manner.
8. The Subject Development Group progresses its work in line with the Council's response (arising from 4a) or the Department's response (arising from 4b and 7).

4. Timelines

The process outlined above will require time. Such time, if involving a number of weeks, could have significant implications for the timeline for specific stages of work on the subject specification and/or the overall completion of the specification ahead of sending it to the Department for consideration. This time factor may necessitate NCCA organising additional online meetings of the Board for Senior Cycle and the Council in order to ensure the development work remains within the overall timelines.

Table 1 below sets out the general parameters and processes to guide the work of the subject development groups (SDG) as they consider the most appropriate assessment for each subject. The specific parameters for each of the Tranche 3 subjects are set out in Table 2.

Table 1: Assessment parameters and processes – general application to tranche 3 subjects

Considerations	Parameters to guide the work of the development group.
Nature	The purpose and nature of the assessment component will be clearly outlined in the subject specification and accompanying guidelines to support the completion of the assessment. Details will be provided on the nature of the component. Existing examples include: • research project/extended essay • oral assessment • performance assessment • portfolio assessment • creation of an artefact • field study • experiment/ proof of concept/ practical investigation. The subject specification and the accompanying guidelines will articulate clearly what the students are required to do, the form(s) in which it can be carried out and submitted, and the workload expectations associated with the assessment. The alignment of the assessment component to a particular set of learning outcomes from the subject specification will be provided, as well as details on which key competencies and associated learning outcomes will be assessed. This does not preclude the same LOs from being assessed in the final examination.
Weighting	The assessment component in each subject will be worth at least 40% of the total available marks.
Timing	The SDG will advise on the time required for the carrying out of the assessment component across the course of study.
Completion and Submission	While the SDG may suggest when this may occur (as referenced above having regard to the assessment load on students in particular), a final decision will be made by the SEC following consideration of the overall schedule of completion dates for all assessments across all subjects. This will be finalised by the SEC following engagement with the NCCA and DE. The dates for final completion and\or submission of the assessment component by the student will be published by the SEC and this detail will not be included in the subject specification. (See table 1 below in relation to Mathematics also)

Design	The majority of assessment components will result in a completed item that is materially different to a traditional written examination and which tests different competencies being transmitted to the SEC and assessed by the SEC. In some instances, the design of the assessment may require examiners to visit schools to conduct the assessment but manageability at school and system level will need to be considered.
Guidance	Guidelines to support the assessment components will be specific to each subject. These guidelines will be developed collaboratively by the NCCA and SEC. They will be informed by the deliberations of the SDG during the development of the specification and will detail: • the purpose of the component concerned i.e., what it is intended to assess. • the nature of the assessment component/activity. • descriptors of quality in the form of a graduated rubric and details on assessment standards at higher and ordinary levels if deemed necessary by the assessment method. • details on the timing of the assessment (its duration and when it could happen). • guidance on the processes that may be used for the administration of the assessment.

Table 2: Parameters for assessment arrangements for each Tranche 3 subject

Subject	Current arrangements	Parameters for new assessment arrangements
Agricultural Science	Written examination is 2.5 hours duration for higher level and ordinary level students and is awarded 300 of the 400 marks available (75%). Coursework is an Individual Investigative Study, which is done in response to a common brief from SEC and is worth 100 marks (25%).	Written examination: typically, 60% weighting. Assessment component: minimum 40% weighting. Written examination will be set at higher and ordinary levels. Assessment component would be based on one submission to SEC in response to a common brief.
Computer Science	The final examination is worth 70% and is 2.5 hours duration on one day towards the end of May. There is a paper-based element	Written examination: typically, 60% weighting. Assessment component: minimum 40% weighting.

	(1.5 hrs.; 130 marks) followed by a computer-based element (I hr.; 80 marks). The coursework is worth 30% of the final marks. The common brief is released in December of 6th year and a report and summary video (90 marks) is typically submitted in March of 6th year. This is completed over a 10-week period. Coursework and practical are set at a common level but are graded in line with the standards that apply to the level at which the candidate sits the written examination. Written examination is examined at higher and ordinary levels.	Written examination will be set at higher and ordinary levels. Assessment component would be based on one submission to SEC in response to a common brief.
Design and Communication Graphics	Written examination has 1 paper worth 240 marks which is 60% of the marks available. This paper is 3 hours in duration. Written examination is examined at higher and ordinary levels. Student assignment is worth 160 marks which is 40% of the marks available. The student assignment at higher level differs from the student assignment at ordinary level with a different brief set for HL and OL students. There are 9 outputs required in a portfolio for both levels with the HL page limit set at 14 pages and OL page limit 12 pages.	Written examination: typically, 60% weighting. Assessment component: minimum 40% weighting. Written examination will be set at higher and ordinary levels. Assessment component would be based on one submission to SEC in response to a common brief.
History	Written examination is worth 80% of the total marks available, and the exam is 2 hour 50 minutes in duration. Coursework is a Research Study Report (RSR) and is allocated the remaining 20%. There is a different	Written examination: typically, 60% weighting. Assessment component: minimum 40% weighting. Written examination will be set at higher and ordinary levels.

	word count for HL and OL students, with the OL word count set at 800 words and the HL word count set at 1600.	Assessment component would be based on one submission to SEC in response to a common brief.
Home Economics	Written examination is 2 hr 30 minutes duration and worth 280 or 320 marks (out of 400) depending on the elective chosen. For students who choose the **Home Design and Management** or **Social Studies** electives, the written examination is worth 80% and the **Food Studies Coursework** is worth 20%. For those who choose the **Textile Fashion and Design** elective, the written exam is worth 70%; the **Food Studies Coursework** is worth 20% and the **TFD Coursework** is allocated 10%. **Food Studies Coursework** is based on 4 assignments completed by the beginning of November of 6th year and submitted to the SEC.	Written examination: typically, 60% weighting. Assessment component: minimum 40% weighting. Written examination will be set at higher and ordinary levels. Assessment component would be based on one submission to SEC in response to a common brief.
Mathematics	There are 2 written papers that are worth the full allocation of marks. Paper 1: HL OL and FL is 2.5 hrs duration. Paper 2: Hl and OL 2.5 hrs duration.	Written examination: typically, 60% weighting. Assessment component: minimum 40% weighting. Written examination will be set at higher ordinary and foundation levels and it would be expected to take the form of a single paper Assessment component would be based on one submission to SEC in response to a common brief. Assessment component to be completed in Year 1 of the two-year programme.
Music	There are 3 areas for assessment:	Written examination: typically, 60% weighting.

	Composing element is worth 25% and assessed by a written paper of 1.5 hours duration. Performing element is worth 25% and is assessed by a performance of 3 or 4 pieces depending on the selection of one performance format or 2. Listening element is worth 25% and is assessed by an aural exam and written paper of 1.5 hours duration. HL Elective: Higher level students select one of the 3 areas above and choose to increase mark allocation to 50% by including an additional assessment activity. For ordinary level students, their best mark in one out of the three areas is doubled to reach 100%-mark allocation.	Assessment component: minimum 40% weighting. Written examination will be set at higher and ordinary levels. Assessment component will be based on a brief issued by the SEC.
Physics and Chemistry	Written paper at HL and OL worth full mark allocation of 400 marks. 3-hour paper. Section 1 Physics worth 200 marks. Section 2 Chemistry worth 200 marks.	Written examination: typically, 60% weighting. Assessment component: minimum 40% weighting. Written examination will be set at higher and ordinary levels. Assessment component would be based on one submission to SEC in response to a common brief.

Whilst an AAC in each subject must have a minimum weighting of 40%; an SDG may propose a weighting of 50%. In these circumstances, the process outlined at Section 3 above will apply to determine if such a weighting receives further consideration as to whether it shall be applied or not. It would not be anticipated that an SDG would seek to apply a weighting to the AAC above this level.

NCCA

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