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Terry Moriarty introduces the new calculus-based courses to be implemented from 2019…

The new NSW Stage 6 Mathematics Advance and Extension Syllabuses were endorsed in 2017. 2018 is a planning year with implementation for Year 11 in 2019 and Year 12 in 2020. There are support materials, such as sample scope and sequence and assessment tasks, available through the NSW Education Standards Authority (NESA) website.

Due to the online nature of the syllabus documents, teachers are encouraged to download and review each section, including the aim and rationale before moving to the course content. New features of the Stage 6 syllabuses and common material include:

- Australian curriculum content identified by codes;
- Learning across the curriculum content, including cross-curriculum priorities, general capabilities and other learning across curriculum areas, are incorporated and identified by icons;
- An interactive glossary.

Additionally, the Mathematics syllabuses include coding of applications and modelling as integral parts of each strand. Some strands are now merged together and the Mathematics Advanced and Mathematics Standard syllabuses contain common material which is identified by a 'paperclip' icon.

Mathematics Advanced

Mathematics Advanced replaces the previous Mathematics 2 Unit syllabus. There is a new organisational structure as well as updates to content.

The Year 11 organisational structure

The Advanced course is organised into Strands, with the strands divided into Topics and Sub-topics. Topics within the strands have been updated, including some content from different topics in the current course, such as Functions, which includes Linear and Trigonometric Functions, as well as new topics.

What to look out for

Some of the topics below have not been included in the new courses:

- Plane Geometry;
- Coordinate Methods in Geometry;
- Harder Applications as a topic;
- Conics.

Some of the topics below have been updated, including some units from different topics:

- Working with Functions includes Linear, Quadratic and Cubic Functions;
- Trigonometry and Measure of Angles, includes the use of two and three dimensions as well as new topics;
- Velocity and acceleration are included in Introduction to Differentiation;
- Financial Mathematics involves sequences and series and their application to financial situations.

Mathematics Advanced: Content

The table below demonstrates the changes between the previous and new syllabus.

2 Unit Preliminary (current in 2018)	**New Mathematics Advanced Year 11 Course - Topics and Sub-topics (to be implemented in 2019)**
• Basic Arithmetic and Algebra • Real functions • Trigonometric ratios • Linear functions • The quadratic polynomial and the parabola • Plane geometry – geometrical properties • Tangent to a curve and derivative of a function	**Functions** MA-F1 Working with Functions **Trigonometric Functions** MA-T1 Trigonometry and Measure of Angles MA-T2 Trigonometric Functions and Identities **Calculus** MA-C1 Introduction to Differentiation **Exponential and Logarithmic Functions** MA-E1 Logarithms and Exponentials **Statistical Analysis** MA-S1 Probability and Discrete Probability Distributions

Mathematics Advanced: Content (continued)

2 Unit HSC Course (Current until 2019)	New Mathematics Advanced Year 12 Course - Topics and Sub-topics (to be implemented in 2020)
• Coordinate methods in geometry • Applications of geometrical properties • Geometrical applications of differentiation • Integration • Trigonometric functions • Logarithmic and exponential functions • Applications of calculus to the physical world • Probability • Series and series applications	**Functions** MA-F2 Graphing Techniques **Trigonometric Functions** MA-T3 Trigonometric Functions and Graphs **Calculus** MA-C2 Differential Calculus MA-C3 The Second Derivative MA-C4 Integral Calculus **Financial Mathematics** MA-M1 Modelling Financial Situations **Statistical Analysis** MA-S2 Descriptive Statistics and Bivariate Data Analysis MA-S3 Random Variables

Mathematics Extension 1: Content

The table below demonstrates the changes between the previous and new syllabus.

3 Unit Preliminary Course (current in 2018)	New Mathematics Extension 1 Year 11 Course - Topics and Sub-topics (to be implemented in 2019)
• Other inequalities • Circle geometry • Further trigonometry • Angles between two lines • Internal & external division of lines into given ratios • Parametric representation • Permutations combinations • Polynomials	**Functions** ME-F1 Further Work with Functions ME-F2 Polynomials **Trigonometric Functions** ME-T1 Inverse Trigonometric Functions ME-T2 further Trigonometric Identities **Calculus** ME-C2 Rates of Change **Combinatorics** ME-A1 Working with Combinatorics

Mathematics Extension 1: Content (continued)

3 Unit HSC Course (current in 2019)	New Mathematics Extension 1 Year 12 Course - Topics and Sub-topics (to be implemented in 2020)
• Methods of integration • Primitive of sin2x and cos2x • Equation dN/dt= k(N-P) • Velocity and acceleration as a function of x • Projectile motion • Simple harmonic motion • Inverse functions & inverse trigonometric functions • Induction • Binomial theorem • Further probability • Iterative methods for numerical estimation of the roots of a polynomial equation • Harder applications of HSC 2 Unit topics	**Functions** ME-F1 Further Work with Functions ME-F2 Polynomials **Trigonometric Functions** ME-T1 Inverse Trigonometric Functions ME-T2 Further Trigonometric Identities **Calculus** ME-C2 Rates of Change **Combinatorics** ME-A1 Working with Combinatorics

Mathematics Extension 2: Content

The table below demonstrates the changes between the previous and new syllabus.

4 Unit Course (current until 2019)	**New Mathematics Extension 2 Course - Topics and Sub-topics (to be implemented in 2020)**
• Graphs • Complex numbers • Conics • Integration • Volumes • Mechanics • Polynomials • Harder 3 Unit topics	**Proof** MEX-P1 The Nature of Proof MEX-P2 Further Proof by Mathematical Induction **Vectors** MEX-V1 Further Work with Vectors **Complex Numbers** MEX-N1 Introduction to Complex Numbers MEX-N2 Using Complex Numbers **Calculus** MEX-C1 Further Integration **Mechanics** MEX-M1 Applications of Calculus to Mechanics

Assessment and examination

Advice regarding assessment and examination has been published on the NESA website and teachers should refer to the site regularly for updates. The most significant change is the approach to the formal school-based assessment program for Year 11 and Year 12.

School-based assessment requirements

Teachers should refer to the NESA *Assessment and Reporting in Mathematics Stage 6* document. Some features of the new syllabuses include:

The Year 11 formal school-based assessment program is to reflect the following requirements:

- three assessment tasks
- the minimum weighting for an individual task is 20%
- the maximum weighting for an individual task is 40%
- one task must be an assignment or investigation-style with a weighting of 20–30%.

The Year 12 formal school-based assessment program is to reflect the following requirements:

- a maximum of four assessment tasks
- the minimum weighting for an individual task is 10%
- the maximum weighting for an individual task is 40%
- only one task may be a formal written examination with a maximum weighting of 30%
- one task must be an assignment or investigation-style with a weighting of 15–30%.

NESA has provided the following examples of some approaches to task types for the assignment or investigation-style task:

- an investigative project or assignment involving presentation of work in class;
- an independently chosen project or investigation;
- scaffolded learning tasks culminating in an open-ended or modelling style problem;
- a guided investigation or research task involving collection of data and analysis.

Teachers can benefit from working collaboratively to plan for these new syllabuses. Access to professional learning time and resources will be essential and courses offered by the Centre for Professional Leaning are an ideal place to begin.

Terry Moriarty has been a Mathematics teacher and Head Teacher in South and South Western Sydney for forty years. He has been involved in curriculum development processes throughout his career.