

Stage 6 Draft Mathematics syllabuses for the 'Have your say' period October–November 2023

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The following document covers the draft syllabuses for Standard, Advanced, Extension 1 and Extension 2. It is basically ready to use, but is being circulated as early as possible to help teachers who are putting in a response to the draft syllabuses to NESA by December 19.

I will be making a free online course late in the Summer holidays covering the changes, and will undoubtedly find a few more points of note compared with this early version!!

Timeline

- The responses to the draft syllabus are due to NESA by December 19 2023.
- The final versions of the syllabus are due out from NESA some time in 2024.
- During 2025 schools plan and prepare for the new syllabuses.
- Implementation:
 - The Year 11 syllabuses are first taught from Term 1 2026.
 - The Year 12 syllabuses are first taught from Term 4 2026.
 - The syllabuses will be first tested at the HSC in 2027.

For context the students who will enter Year 9 in 2024 will be the first students to use the new syllabuses.

This document will be updated once the syllabuses are finalised, and the online course will be updated.

General Summary of the new syllabuses:

- The majority of the content in each syllabus remains the same.
- In general each syllabus has a lot more detail than the 2017 syllabus, clearing up many of the questions that teachers have had.
- In general each syllabus is presented more clearly than the 2017 syllabus, and should be easier to use.
- Topics are now called focus areas.
- There are no codes at the start of focus area names, and only the first letter is uppercase.
- The names of most focus areas are the same as the topics they replace.
- Most content stays in the same year, though some topics move from Year 11 to Year 12, or vice versa.
- A small number of topics have been split into two focus areas or combined into one.
- Some content moves to a different focus area.

Common Content - Standard and Advanced

- There is still common content between Standard and Advanced, but it is not marked on the draft syllabuses.
- There will be 15-20 marks of common content in the Standard 1 and Standard 2 HSCs.
- There will be 15-20 marks of common content in the Standard 2 and Advanced HSCs.

Standard Rhombus

- There is no indication that the Year 11 Standard course will have a rhombus option, for students who will do Standard 1 in Year 12.

Mathematics Standard 11-12

Overview of the Changes to the Content

- Networks now starts in Year 11.
- Statistical investigations are now covered in Year 11.
- Simple interest and straight-line depreciation move to Year 12.
- Relative frequency and probability move to Year 12.
- Some focus areas combine or split, and some content moves to another focus area.
- Overall I am making an educated guess that:
 - Standard 1 can be taught in 6 fewer lessons than the 2017 syllabus.
 - Standard 2 can be taught in the same number of lessons as the 2017 syllabus.

Year 11 Standard

- Within Year 11 Standard
 - Currency conversions move from *MS-A2 Linear Relationships* to *Managing money*.
 - *MS-F1 Money Matters* is split into *Earning money* and *Managing money* (plus simple interest and straight-line depreciation move to Year 12 as above).
- From Year 12 Standard 1 or Standard 2:
 - *MS-N1 Networks and Paths* from Standard 1 and *MS-N2 Network Concepts* from Standard 2 move to Year 11 as *Networks, paths and trees*.
 - *S3.1: The statistical investigation process for a survey* moves from Standard 1 *MS-S3 Standard 1 Further Statistical Analysis* to Year 11 *Data analysis*.
- To Year 12 Standard 1 or Standard 2:
 - *MS-S2 Relative Frequency and Probability* moves from Year 11 to Year 12 Standard 1 and Year 12 Standard 2 as *Relative frequency and probability*.
 - Simple interest and straight-line depreciation move from Year 11 *MS-F1 Money Matters* to Year 12 Standard 1 *Investment and Depreciation and loans*, and Year 12 Standard 2 *Investment and loans*.

Year 12 Standard 1


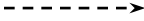
- Within Year 12 Standard 1:
 - *MS-S4 Rates and MS-S5 Scale Drawings* have been combined into the focus area *Rates and ratio*.
- From Year 11 Standard:
 - *MS-S2 Relative Frequency and Probability* becomes *Relative frequency and probability*.
 - Simple interest moves from *MS-F1 Money Matters* to *Investment*.
 - Straight-line depreciation moves from *MS-F1 Money Matters* to *Depreciation and loans*.
- To Year 11 Standard:
 - *MS-N1 Networks and Paths* moves to Year 11 *Network, paths and trees*.

Year 12 Standard 2

- Within Standard 2
 - *Critical Path Analysis* has been split within Year 12 into *Network flow* and *Critical path analysis*.
- From Year 11 Standard:
 - *MS-S2 Relative Frequency and Probability* becomes *Relative frequency and probability*.
 - Simple interest and straight-line depreciation move from Year 11 *MS-F1 Money Matters* to Year 12 Standard 2 *Investment and loans*.
- To Year 11 Standard:
 - *Network Concepts* moves to Year 11 *Network, paths and trees*.

See the diagram of the changes next page.

Mapping the Changes

-  Solid arrow - all or most of the content moves here
 Dashed arrow - a small amount of the content moves here

2017 Topics

Year 11 - Standard

- MS-A1 Formulae and Equations
- MS-A2 Linear Relationships
- MS-M1 Applications of Measurement
- MS-M2 Working with Time
- MS-S1 Data Analysis
- MS-F1 Money Matters

MS-F1 Money Matters

MS-S2 Relative Frequency and Probability

Year 12 - Standard 1

- MS-A3 Types of Relationships
- MS-F2 Investment
- MS-F3 Depreciation and Loans
- MS-M3 Right-angled Triangles
- MS-M4 Rates
- MS-M5 Scale Drawings
- MS-S3 Further Statistical Analysis
- MS-N1 Networks and Paths

MS-N1 Networks and Paths

Year 12 - Standard 2

- MS-A4 Types of Relationships
- MS-F4 Investment and Loans
- MS-F5 Annuities
- MS-M6 Non-right-angled Triangles
- MS-M7 Rates and Ratios
- MS-S5 The Normal Distribution
- MS-S4 Bivariate Data Analysis
- MS-N3 Critical Path Analysis
- MS-N2 Network Concepts

MS-N2 Network Concepts

Draft Focus areas

Year 11 - Standard

- Formulas and equations
- Linear relationships
- Applications of measurement
- Time and location
- Data analysis
- Earning money
- Managing money
- Networks, paths and trees

Year 12 - Standard 1

- Algebraic relationships
- Investment
- Depreciation and loans
- Right-angled triangles
- Ratios and rates
- Bivariate data analysis
- Relative frequency and probability

Year 12 - Standard 2

- Algebraic relationships
- Investment and loans
- Annuities
- Trigonometry
- Ratios and rates
- The normal distribution
- Bivariate data analysis
- Network flow
- Critical path analysis
- Relative frequency and probability

Internal Assessments

Year 11 Standard

- there are still 3 assessment tasks
- there is no requirement for an assignment or investigation-style task
- there is no limit on the number of formal examinations allowed in Year 11 (still one maximum in Year 12 though)
- the recommended weighting range of 20% to 40% is now a requirement

Year 12 Standard 1 and Year 12 Standard 2

- there are still a maximum of 4 assessment tasks
- there is no requirement for an assignment or investigation-style task
- only one formal examination is allowed in Year 12 (more than one is allowed in Year 11)
- the formal examination can be worth up to the task maximum of 40% (rather than the previous limit of 30%).
- the weighting range is still 10% to 40% and is still a requirement

HSC Examinations

Standard 1

- all Year 11 content is assumed knowledge for the Standard 1 HSC since there is no mention of the rhombus symbol for Year 11 content unlike in the 2017 syllabus.
- there are now only 15-20 marks of common content between Standard 1 and Standard 2, down from 20-25 marks.
- there will be at least 8 common items, previously not specified.
- all other examination details stay the same - exam and reading time length, number of marks in each section, the number of items, the number of 4 or 5 mark questions.

Standard 2

- there are now only 15-20 marks of common content between Standard 1 and Standard 2, and between Advanced and Standard 2, down from 20-25 marks.
- there will be at least 8 common items between each pair of exams, previously not specified.
- all other examination details stay the same - exam and reading time length, number of marks in each section, the number of items, the number of 4 or 5 mark questions.

Year 11 Content

Formulas and equations

Summary

Formulas and equations is very similar to *MS-A1 Formulae and Equations* from 2017, with the small addition of using spreadsheets for substituting formula.

Overall *Formulas and equations* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Describing the limitations of using the Blood Alcohol Content formula is not mentioned.

What has been adjusted?

- Nil.

What has been added?

- Using a spreadsheet to calculate formulas when variables are entered

What will teachers need to change if the Draft goes ahead as is?

- Include spreadsheets to calculate formulas

Linear relationships

Summary

Linear relationships is very similar to *MS-A2 Linear Relationships* from 2017, with a small amount of new material added - interpolating and extrapolating from a linear model and using a spreadsheet to model a linear relationship.

Linear relationships has been divided into two content groups: Linear modelling; and Direct variation.

Overall *Linear relationships* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Currency conversions have moved to *Managing money*.

What has been adjusted?

- Nil

What has been added?

- Interpolate and extrapolate from a linear model
- Use a spreadsheet to model a linear relationship

What will teachers need to change if the Draft goes ahead as is?

- Include questions on interpolation and extrapolation on a linear relationship
- Use spreadsheets in modelling linear relationships

Earning money

Summary

Earning money is very similar to *F1.2 Earning and managing money* from *MS-F1 Money Matters* from 2017. Most of the remainder of *MS-F1 Money Matters* has moved to the next focus area, *Managing Money*, while simple interest and depreciation move to Year 12.

Earning money has been divided into two content groups: Ways of earning; and Taxation.

Overall *Earning money* should take the same number of lessons to teach as was required for F1.2 in the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil

What has been adjusted?

- Nil

What has been added?

- Nil

What will teachers need to change if the Draft goes ahead as is?

- Split *MS-F1 Money Matters* into two Year 11 topics if required, plus move simple interest and depreciation to Year 12.
- Check definitions and detail

Managing money

Summary

Managing money is mainly part of *F1.1 Interest and depreciation* and all of *F1.3 Budgeting and household expenses* from *MS-F1 Money Matters*. Currency conversions have moved from *MS-A2 Linear Relationships*, buy now pay later payment options are added and buying on terms is specifically mentioned. As mentioned above simple interest and depreciation move to Year 12

Managing money has been divided into two content groups: Purchasing goods; and Budgeting.

Overall *Managing money* should one less lesson to teach than *F1.1* and *F1.3*.

Detail

What has been moved or removed from the 2017 topic(s)?

- Simple interest moves to Yr 12 Investment while Depreciation moves to Yr 12 Depreciation and loans.

What has been adjusted?

- Nil.

What has been added?

- Currency conversions have moved from *MS-A2 Linear Relationships*
- Buy now pay later added.

What will teachers need to change if the Draft goes ahead as is?

- Rearrange content between topics as above.
- Check that buying on terms is already covered.
- Add questions on buy now pay later.

Applications of measurement

Summary

Applications of measurement is mainly *MS-M1 Applications of Measurement* with the removal of measurement error, similar figures and food energy, with electrical energy moved to Yr 12 Standard 2 *Ratios and rates*.

Applications of measurement has been divided into two content groups: Practicalities of measurement; and Perimeter, area and volume.

Overall *Applications of measurement* should take three less lessons to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Measurement error, absolute error and percentage error have been removed.
- Scale factor to find unknown sides in similar figures.
- Units of energy in food have been removed from the syllabus.
- Units of electrical energy have been moved to Yr 12 Standard 2 *Ratios and rates*.

What has been adjusted?

- Volume of cones is specifically mentioned.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Remove measurement error, similar figures and food energy.
- Move electrical energy to Yr 12 Standard 2 *Ratios and rates*.

Time and location

Summary

Time and location covers similar content to *MS-M2 Working with Time* from 2017. There is no mention of the International Date Line, nor using international times zones to find the time difference between two places on Earth. They can still be found using differences in latitude, but time zones are only used for countries neighbouring Australia. Calculating elapsed time is now mentioned.

Time and location has been divided into two content groups: Positions on the Earth's surface; and Time and time difference.

Overall *Time and location* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- International Date Line and finding time differences between two places on Earth using Time Zones have been removed, but probably still a good idea to cover them.

What has been adjusted?

- Nil.

What has been added?

- Calculating elapsed times.

What will teachers need to change if the Draft goes ahead as is?

- Ensure that you cover elapsed times.

Networks, paths and trees

Summary

Networks, paths and trees covers the content from Year 12 Standard 2 *MS-N2 Network Concepts*, with a little more detail. Compared with Year 12 Standard 1 *MS-N1 Network Concepts* it also includes investigating and solving practical problems and solving minimal connector problems.

Networks, paths and trees has been divided into two content groups: Network concepts; and Shortest paths and spanning trees.

Overall *Networks, paths and trees* should take the same number of lessons to teach as was required for Year 12 Standard 2 *MS-N2 Network Concepts* from the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- Nil.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Probably no changes needed from Year 12 Standard 2 *MS-N2 Network Concepts*.
- Check that if you are using lessons from Standard 1 that they include investigating and solving practical problems and solving minimal connector problems.

Data analysis

Summary

Data analysis is similar to *MS-S1 Data Analysis* plus *S3.1 The statistical investigation process for a survey* from Yr 12 Standard 1 *MS-S3 Further Statistical Analysis*. There have also been several small changes in content, mentioned below.

Data analysis has been divided into eight content groups: Statistical investigation process; Population and sample; Data classification; Display and interpret grouped and ungrouped data; Measures of centre and spread; Quartiles and interquartile range; 5-number summary and box plots; and Clusters and Outliers.

Overall *Data analysis* should take approximately two more lessons to teach than was required for the corresponding content in the 2017 syllabus. Since there are so many changes this might change.

Detail

What has been moved or removed from the 2017 topic(s)?

- Using the statistical investigation process to compare two groups has been removed.
- Pareto charts are removed.
- Deciles and percentiles are removed.

What has been adjusted?

- Lots more detail has been added in this focus area.

What has been added?

- Recognising when data needs to be grouped.
- Line graphs, sector graphs and divided bar graphs are mentioned (already covered in Stage 5).
- Statistical infographics are mentioned.
- Using spreadsheets to calculate measures of centre and spread, to find 5-number summaries and to draw box plots.

What will teachers need to change if the Draft goes ahead as is?

- Thoroughly check this focus area as there have been lots of small changes.

Year 12 Standard 1 Content

Algebraic relationships

Summary

Algebraic relationships is very similar to MS-A3 Types of Relationships from the 2017 syllabus.

Algebraic relationships has been divided into two content groups: Simultaneous linear equations; and Graphs of practical situations.

Overall *Algebraic relationships* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil

What has been adjusted?

- Nil.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Check the definitions given in lessons match those in the syllabus.

Investment

Summary

Investment covers the content of *MS-F2 Investment* plus simple interest from *MS-F1 Money Matters* in Year 11. There is a small addition involving comparing and contrasting different investment strategies.

Overall *Investment* should take the same number of lessons to teach as was required for the equivalent content in the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil

What has been adjusted?

- Different definitions

What has been added?

- Comparing and contrasting different investment strategies.

What will teachers need to change if the Draft goes ahead as is?

- Move simple interest from Year 11 *MS-F1 Money Matters*
- Check that you have covered comparing and contrasting different investment strategies.
- Check definitions

Depreciation and loans

Summary

Depreciation and loans mainly covers the content from *MS-F3 Depreciation and Loans* with straight-line depreciation from Year 11 *MS-F1 Money Matters* added.

Depreciation and loans has been divided into three content groups: Depreciation; Loans; and Credit cards..

Overall *Depreciation and loans* should take one more lesson to teach as was required for MS-F3 in the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil

What has been adjusted?

- No mention of online calculators to investigate loans - any method is fine.

What has been added?

- Explaining the similarities and differences between declining balance and compound interest formula - no mention of doing the same with straight-line and simple interest.
- Compare straight-line and declining balance depreciation.

What will teachers need to change if the Draft goes ahead as is?

- Move straight-line depreciation from Year 11 *MS-F1 Money Matters*.
- Check that you cover the similarities and differences of the declining balance and compound interest formula.
- Compare straight-line and declining balance depreciation.

Right-angled triangles

Summary

Right-angled triangles is very similar to the content from *MS-M3 Right-angled Triangles*. The main difference is the removal of any mention of navigation methods used by other cultures including Aboriginal and Torres Strait Islander Peoples.

Overall *Right-angled triangles* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Navigation methods used by other cultures.

What has been adjusted?

- Nil.

What has been added?

- Nil

What will teachers need to change if the Draft goes ahead as is?

- No changes needed, but alternative navigation methods can be removed.

Ratios and rates

Summary

Ratios and rates mainly combines *MS-M4 Rates* and *MS-M5 Scale Drawings*, with some relatively minor content removed and a small amount of new content added.

Ratios and rates has been divided into two content groups: Ratios; and Rates.

Overall *Ratios and rates* should take about two less lessons to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- The work on heart rates has been removed.
- Similarity has been removed.
- Commonly used symbols and abbreviations on plans have been removed, but probably leave them in
- Estimating quantities, materials and costs has been removed.

What has been adjusted?

- Nil.

What has been added?

- The relationship between ratios and fractions is mentioned
- The difference between ratios and rates is mentioned

What will teachers need to change if the Draft goes ahead as is?

- Remove heart rates, similar figures and estimation of quantities and materials from plans.

Bivariate data analysis

Summary

Bivariate data analysis is largely content from *S3.2 Exploring and describing data from two quantitative variables* from *MS-S3 Further Statistical Analysis* in the 2017 syllabus, with a small amount of extra content and a small amount removed. *S3.1 The statistical investigation process for a survey* is now in Year 11 *Data analysis*.

Bivariate data analysis has been divided into two content groups: Bivariate datasets; and Scatter plot and line of best fit.

Overall *Bivariate data analysis* should take the same number of lessons to teach as *S3.2* needed for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Collecting data, interpreting and constructing graphs has been removed.

What has been adjusted?

- Nil.

What has been added?

- Distinguishing between one variable and bivariate data
- Correlation versus causation is mentioned

What will teachers need to change if the Draft goes ahead as is?

- Remove questions on surveys to Year 11. Remove or reduce questions on collecting data and constructing graphs
- Make sure that you already cover one variable versus bivariate data and correlation versus causation.

Relative frequency and probability

Summary

Relative frequency and probability is very similar to *MS-S2 Relative Frequency and Probability* from Year 11 in the 2017 syllabus.

Overall *Relative frequency and probability* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- No mention of identifying factors that could complicate simulations of real-world events, but easy enough to keep in.

What has been adjusted?

- Tree Diagrams and Arrays can only be with replacement in Standard 1.

What has been added?

- Nil

What will teachers need to change if the Draft goes ahead as is?

- No changes needed

Year 12 Standard 2 Content

Algebraic relationships

Summary

Algebraic relationships is largely the same as *MS-A4 Types of Relationships* from the 2017 syllabus, with the addition of algebraic solutions to simultaneous equations, using graphing applications for all four functions, using spreadsheets for break-even points, identifying limits of applications for exponential and reciprocal functions, and finding the turning point of a parabola using the midpoint of the x -intercepts. There is no mention of the axis of symmetry for a parabola.

Algebraic relationships has been divided into four content groups: Simultaneous linear equations; Exponential functions; Quadratic functions; and Reciprocal functions.

Overall *Algebraic relationships* should take at least three more lessons to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Axis of symmetry of a parabola not mentioned but best to still cover it.

What has been adjusted?

- Discussing the practical limitations of the exponential and reciprocal functions.

What has been added?

- Algebraic solutions to simultaneous equations.
- Using graphing applications for all functions mentioned.

What will teachers need to change if the Draft goes ahead as is?

- Add two lessons on solving simultaneous equations algebraically.
- Add at least one lesson on using graphing applications and spreadsheets.
- Make sure you cover the limitations of the exponential and reciprocal functions.

What are the differences between Standard 1 and Standard 2?

- In Std 2 students solve simultaneous equations algebraically as well as graphically, but only graphically in Std 1.
- In Std 2 students use graphing applications and spreadsheets to find points of intersection of simultaneous equations.
- Std 1 has the content group Graphs of practical situations, while Std 2 has the content groups Exponential functions, quadratic functions and Reciprocal functions.

Investment and loans

Summary

Investment and loans is a combination of content from Year 11 *MS-F1 Money Matters* and Year 12 Standard 2 *MS-F4 Investment and Loans*, with a small number of additions.

Investment and loans has been divided into four content groups: Investment; Depreciation; Loans; and Credit cards.

Overall *Investment and loans* should take one more lesson to teach than was required for *MS-F4 Investment and Loans* in the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil

What has been adjusted?

- Nil.

What has been added?

- Simple interest and straight-line depreciation have moved from Year 11 *MS-F1 Money Matters*.
- Recognising simple interest as a linear function and compound interest as an exponential function.
- Using spreadsheets to model simple and compound interest, and reducing balance loans
- Comparing types of credit to manage finances
- Effect of additional payments or lump sums on the term and cost of a loan

What will teachers need to change if the Draft goes ahead as is?

- Move simple interest and straight-line depreciation from Year 11.
- Mention linear/exponential for simple/compound interest.
- Use spreadsheets for simple and compound interest, and reducing balance loans.
- Cover the types of credit to manage finances, and additional payments or lump sums on the term and cost of a loan.

What are the differences between Standard 1 and Standard 2?

- Std 1 covers the content in two separate focus areas, *Investment* and *Depreciation and loans* versus one focus area in Std 2 *Investment and loans*.
- Std 2 covers simple interest as a linear function and compound interest as an exponential function.
- Std 2 uses spreadsheets in modelling simple and compound interest.
- Std 2 covers the effect of varying the rate, term or compounding period with compound interest.
- Std 2 covers shares and dividends.
- Std 2 doesn't mention the similarities and differences between declining balance and compound interest formula.
- Std 2 mentions using a spreadsheet to model and solve problems involving reducing balance loans.

Annuities

Summary

Annuities is the same as *MS-F5 Annuities* in the 2017 syllabus but with more detail.

Overall *Annuities* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil

What has been adjusted?

- Modelling an annuity is limited to 4 time periods.

What has been added?

- Nil

What will teachers need to change if the Draft goes ahead as is?

- Check that any modelling has a maximum of 4 time periods

What are the differences between Standard 1 and Standard 2?

- *Annuities* is not covered in Standard 1.

Trigonometry

Summary

Trigonometry is very similar to *MS-M6 Non-right-angled Trigonometry* from the 2017 syllabus, with only minor changes.

Overall *Trigonometry* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Navigation methods used by other cultures including Aboriginal and Torres Strait Islander Peoples has been removed.
- Using technology to investigate the sign of sine and cosine for obtuse angles has been removed.

What has been adjusted?

- Nil.

What has been added?

- Both versions of the Sine and Cosine Rules are now specifically mentioned

What will teachers need to change if the Draft goes ahead as is?

- No changes needed

What are the differences between Standard 1 and Standard 2?

- Std 2 covers non-right angle triangles as well as right-angled triangles, while Std 1 only covers right-angled triangles.

Ratios and rates

Summary

Ratios and rates is very similar to *MS-M7 Rates and Ratios* from 2017, with some content removed and a small amount added.

Ratios and rates has been divided into two content groups: Ratios; and Rates.

Overall *Ratios and rates* should take about the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- The work on heart rates has been removed.
- Exact definition of a watt is no longer used - matches changes to energy in Year 11.
- The energy rating of appliances and local council requirements for energy efficient housing are no longer mentioned.
- Commonly used symbols and abbreviations on plans have been removed, but probably leave them in.

What has been adjusted?

- No specific mention of speed.

What has been added?

- The relationship between ratios and fractions is mentioned.
- The difference between ratios and rates is mentioned.

What will teachers need to change if the Draft goes ahead as is?

- Cover the relationship between ratios and fractions, and the difference between ratios and rates.
- There is the possibility of leaving everything else alone, but to reduce padding out the syllabus you could remove or reduce work on heart rates, joules, energy ratings, energy efficiency requirements and commonly used symbols and abbreviations in plans.

What are the differences between Standard 1 and Standard 2?

- Most of the content overlaps.
- Std 2 calculates perimeters, areas and volumes of sections of land including from scale diagrams.
- Std 2 includes converting between watts and kilowatts, and problems involving energy.
- Std 2 includes capture-recapture.
- Std 1 includes Distance-time graphs.

Network flow

Summary

Network flow includes part of *MS-N3 Critical Path Analysis* from 2017, with more detail provided.

Overall *Network flow* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- Increasing or decreasing the flow capacity of an edge is specifically mentioned.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Check that you have questions covering increasing or decreasing the flow capacity of an edge

What are the differences between Standard 1 and Standard 2?

- *Network flow* is not covered in Standard 1.

Critical path analysis

Summary

Critical path analysis includes the remainder of *MS-N3 Critical Path Analysis* from 2017, with more detail provided and additional content.

Overall *Critical path analysis* should take one more lesson to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- Dummy variables are specifically mentioned.

What has been added?

- Gantt charts are mentioned.
- Using spreadsheets to model projects is mentioned.

What will teachers need to change if the Draft goes ahead as is?

- Add Gantt charts and spreadsheets.
- Check that questions with dummy variables are included.

What are the differences between Standard 1 and Standard 2?

- *Critical path analysis* is not covered in Standard 1.

Bivariate data analysis

Summary

Bivariate data analysis is largely *MS-S4 Bivariate Data Analysis* from 2017, with some content on creating surveys moved to Year 11 *Data analysis*.

Bivariate data analysis has been divided into two content groups: Bivariate datasets; and Scatter plot and line of best fit, with the majority of content similar to Standard 1.

Overall *Bivariate data analysis* should take the same number of lessons to teach as S3.2 needed for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Awareness of issues of privacy and bias, ethics etc has moved to Year 11 *Data analysis*.

What has been adjusted?

- Nil.

What has been added?

- Distinguish between one variable and bivariate data.
- Correlation versus causation is mentioned.

What will teachers need to change if the Draft goes ahead as is?

- Make sure that you already cover one variable versus bivariate data and correlation versus causation.

What are the differences between Standard 1 and Standard 2?

- Most of the content overlaps.
- Std 2 calculates the intercept and gradient of the line of best fit.
- Std 2 includes Pearson's coefficient and the least-squares regression line.

Relative frequency and probability

Summary

Relative frequency and probability is fairly similar to *MS-S2 Relative Frequency and Probability* from the Year 11 2017 syllabus, with the addition of Venn diagrams and 2-way tables.

Overall *Relative frequency and probability* should take one more lesson to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- Tree Diagrams and Arrays can be with replacement or without replacement.

What has been added?

- Venn diagrams and 2-way tables.

What will teachers need to change if the Draft goes ahead as is?

- Add Venn diagrams and 2-way tables

What are the differences between Standard 1 and Standard 2?

- Most of the content overlaps.
- Std 2 includes Venn diagrams and 2-way Tables.
- Tree Diagrams and Arrays in Std 1 can only use multi-stage events with replacement, whereas Std 2 includes multi-stage events with or without replacement

The normal distribution

Summary

The normal distribution is the same as *MS-S5 The Normal Distribution* in the 2017 syllabus, with more detail.

The normal distribution has been divided into three content groups: Normally distributed datasets; z -scores; and Probability using z -scores.

Overall *The normal distribution* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- Nil.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- No changes needed

What are the differences between Standard 1 and Standard 2?

- *The normal distribution* is not covered in Standard 1.

Overview of the Changes to the Content

- The biggest change is the removal of Statistics from the Advanced syllabus, which returns the Advanced syllabus back to its previous calculus-based focus.
- Most transformations (except for trigonometric graphs) are gathered together in one Year 11 topic rather than scattered as they have been.
- Discrete probability distributions move to Year 12 with continuous probability distributions.
- Differential calculus moves to Year 11.
- A small amount of simple calculus content has moved from Ext 1.
- Overall I am making an educated guess that the course can be taught in approximately two fewer lessons than the 2017 syllabus.

Year 11 Advanced

- Within Year 11 Advanced
 - *Working with functions* now only includes basic graphs, with transformations moving to *Graph transformations*. The graphing of most transformations (except trigonometric graphs) now comes together in the one topic instead of being split amongst Year 11 topics.
 - Complementary angles and angles of any magnitude move from *MA-T2 Trigonometric Functions and Identities* to *Trigonometry and measure of angles*.
 - *Probability* is now a stand-alone focus area with discrete probability distributions moving to Year 12.
- From Year 12 Advanced:
 - *MA-F2 Graphing Techniques* from Year 12 becomes *Graph transformations* in Year 11
 - *MA-C2 Differential calculus* from Year 12 becomes *Differential calculus* in Year 11.
- To Year 12 Advanced:
 - *S1.2: Discrete probability distributions* moves from *MA-S1 Probability and Discrete Probability Distributions* in Year 11 to *Random variables* in Year 12, to join continuous probability distributions.

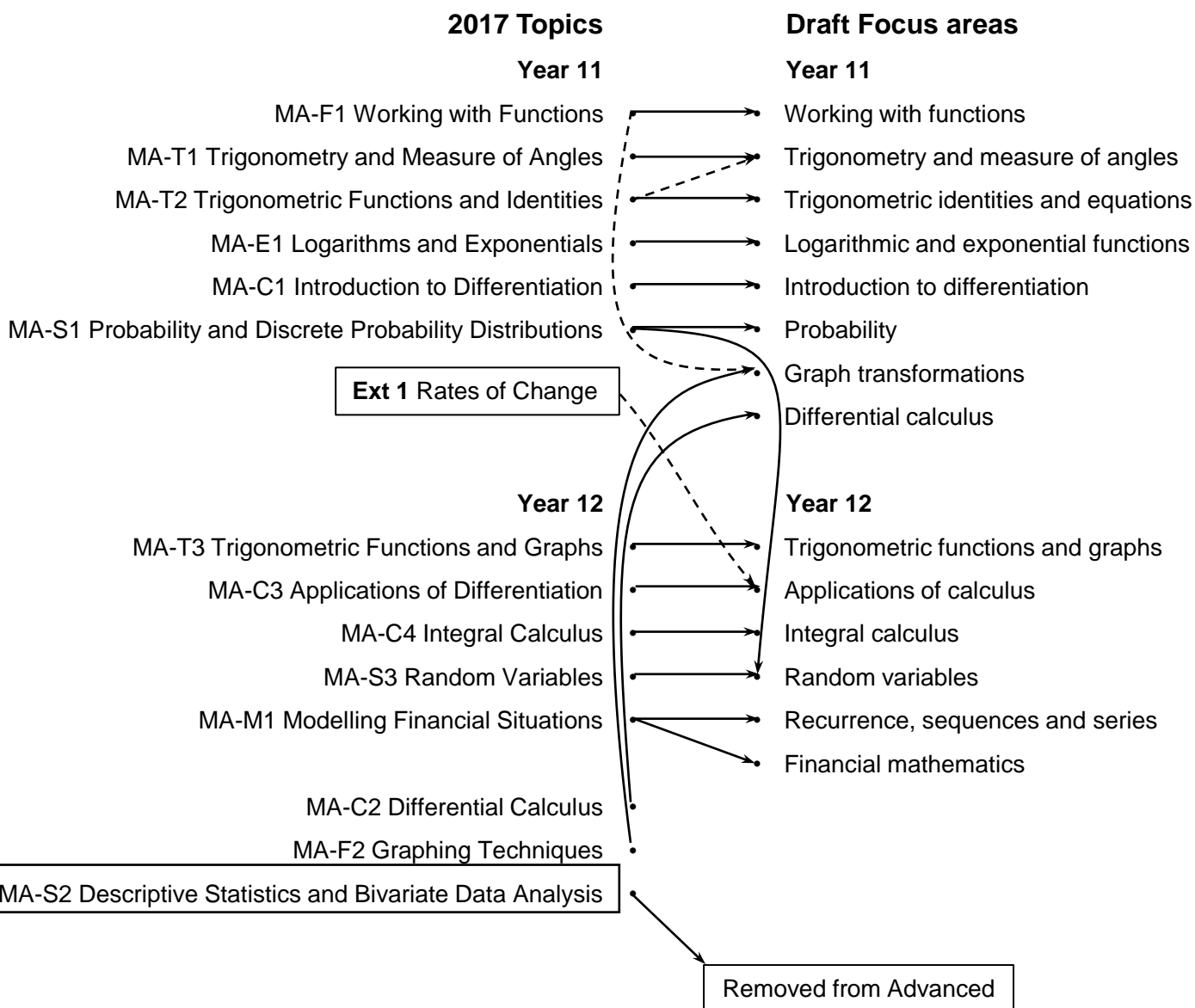
Year 12 Advanced

- Within Year 12 Advanced:
 - *MA-S2 Descriptive Statistics and Bivariate Data Analysis* has been removed from Mathematics Advanced.
 - *MA-M1 Modelling Financial Situations* has been split into *Recurrence, sequences and series* and *Financial mathematics*.
- From Year 11 Advanced:
 - *S1.2: Discrete probability distributions* moves from *MA-S1 Probability and Discrete Probability Distributions* in Year 11 to *Random variables* in Year 12, to join continuous probability distributions.
- To Year 11 Advanced:
 - *MA-F2 Graphing Techniques* from Year 12 becomes *Graph transformations* in Year 11
 - *MA-C2 Differential calculus* from Year 12 becomes *Differential calculus* in Year 11.
- From Year 11 Extension 1:
 - *C1.1: Rates of change with respect to time* moves from Extension 1 *ME-C1 Rates of Change* to *Applications of calculus*.

See the diagram of the changes next page.

Mapping the Changes

- > Solid arrow - all or half of the content moves here
- - - - -> Dashed arrow - a small amount of content moves here



Internal Assessments

Year 11 Advanced

- there are still 3 assessment tasks
- there is no requirement for an assignment or investigation-style task
- there is no limit on the number of formal examinations allowed in Year 11 (still one maximum in Year 12 though)
- the recommended weighting range of 20% to 40% is now a requirement

Year 12 Advanced

- there are still a maximum of 4 assessment tasks
- there is no requirement for an assignment or investigation-style task
- only one formal examination is allowed in Year 12 (more than one is allowed in Year 11)
- the formal examination can be worth up to the task maximum of 40% (rather than the previous limit of 30%).
- the weighting range is still 10% to 40% and is still a requirement

HSC Examination

Advanced

- there are now only 15-20 marks of common content between Standard 1 and Standard 2, down from 20-25 marks.
- there will be at least 8 common items, previously not specified.
- all other examination details stay the same - exam and reading time length, number of marks in each section, the number of items, the number of 4 or 5 mark questions.

Year 11 Advanced Content

Working with functions

Summary

Working with functions is largely content from *MA-F1 Working with Functions*. Some concepts have been moved around within the focus area, and a couple of small concepts from later topics have been brought forward such as basic exponential functions. Graphing only includes the basic graph of each type, with transformations moved to a separate topic.

Working with functions has been divided into nine content groups: Algebraic techniques; Introduction to functions; Linear functions; Quadratic and cubic functions; Exponential functions; Reciprocal functions; Circles and semicircles; Piecewise functions; and Absolute value functions.

Overall *Working with functions* should take one more lesson to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Polynomials are now only taught in Ext 1.
- One-to-one and one-to-many etc are gone from the syllabus (yay)!

What has been adjusted?

- Transformations have been moved to a separate focus area later in Year 11, rather than being mixed in with early topics, so only the basic graphs are drawn in earlier topics.
- There is no specific mention of the domain and range of a composite function.

What has been added?

- Set notation is mentioned in more detail.
- General form of a line returns.
- Piecewise functions are mentioned specifically.
- Basic exponential graphs and the definition of e have moved from *MA-E1 Logarithms and Exponentials*.

What will teachers need to change if the Draft goes ahead as is?

- Given the number of changes teachers will need to check off each dot point to make sure everything is covered.

Trigonometry and measure of angles

Summary

Trigonometry and measure of angles includes all the content from *MA-T1 Trigonometry and Measure of Angles* and part of *MA-T2 Trigonometric Functions and Identities*. In total the two Year 11 Trigonometry topics cover the same content with more detail. The only change is that the area of segments are reintroduced to the syllabus.

Trigonometry and measure of angles has been divided into two content groups: Trigonometry; and Radians.

Overall *Trigonometry and measure of angles* and *Trigonometric identities and equations* should take the same number of lessons to teach as was required for Yr 11 Trigonometry in the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- Nil.

What has been added?

- Complementary angles, $\tan x = \frac{\sin x}{\cos x}$ and unit circle definitions (angles of any magnitude) have moved here from the other Yr 11 Trig topic
- The area of a segment is included.

What will teachers need to change if the Draft goes ahead as is?

- If all of Yr 11 Trig isn't covered as one topic then move complementary angles, $\tan x = \frac{\sin x}{\cos x}$ and unit circle definitions (angles of any magnitude) to this topic
- Include questions on areas of segments.

Trigonometric identities and equations

Summary

Trigonometric identities and equations covers the remainder of *MA-T2 Trigonometric Functions and Identities* from 2017 that has not been moved to *Trigonometry and measure of angles*.

Overall *Trigonometry and measure of angles* and *Trigonometric identities and equations* should take the same number of lessons to teach as was required for Year 11 Trigonometry in the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Complementary angles, $\tan x = \frac{\sin x}{\cos x}$ and unit circle definitions (angles of any magnitude) have moved from here to the other Year 11 Trig topic

What has been adjusted?

- Nil.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- If all of Year 11 Trig isn't covered as one topic then move complementary angles, $\tan x = \frac{\sin x}{\cos x}$ and unit circle definitions (angles of any magnitude) to the other Year 11 Trig topic.

Introduction to differentiation

Summary

Introduction to differentiation is very similar to *MA-C1 Introduction to Differentiation* from 2017 with the exception that $m = \tan \theta$ is no longer mentioned.

Introduction to differentiation has been divided into four content groups Continuity and limits; Gradients of tangents and difference quotients; The derivative and its graph; and Calculating with derivatives.

Overall Introduction to differentiation should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- $m = \tan \theta$ is no longer mentioned

What has been adjusted?

- Nil.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- No changes needed - I would leave $m = \tan \theta$ in.

Logarithmic and exponential functions

Summary

Logarithmic and exponential functions covers mostly the same content as *MA-E1 Logarithms and Exponentials* in the 2017 syllabus, with the exception that a small amount of content has moved to *Working with Functions*, *Differential calculus* and *Graph Transformations*. Since e is introduced in *Working with functions* all logarithms are considered together making the syllabus simpler than [2017].

Overall Logarithmic and exponential functions should take two less lessons to teach than was required for the 2017 syllabus, though these lessons simply move to other topics.

Detail

What has been moved or removed from the 2017 topic(s)?

- Basic exponential graphs and e are covered in *Working with functions*.
- $\frac{d}{dx}(e^x) = e^x$ is covered in *Differential calculus*.
- Transformations of exponential and logarithmic curves are covered in *Graph transformations*.

What has been adjusted?

- Nil.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Move basic exponential graphs and e to *Working with functions*.
- Move $\frac{d}{dx}(e^x) = e^x$ to *Differential calculus*.
- Move transformations of exponential and logarithmic curves to *Graph Transformations*.

Graph transformations

Summary

Graph transformations covers the same content as *MA-F2 Graphing Techniques* from 2017 in more detail, and with the transformations of all graphs except trigonometric graphs moved together..

Overall Graph transformations should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- Nil.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Check that all definitions are adjusted as necessary.

Differential calculus

Summary

Differential calculus is very similar to *MA-C2 Differential Calculus* from the Year 12 2017 syllabus with differentiation of e^x and the reciprocal trigonometric ratios added. Differentiation of trig functions involves x rather than $f(x)$ as the argument, which is covered in *Trigonometric functions and graphs* in Year 12.

Differential calculus is divided into two content groups Differentiation of exponential, logarithmic and trigonometric functions; and Rules of differentiation.

Overall Differential calculus should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Derivatives of trig functions of $f(x)$ is moved to Trigonometric functions and graphs in Year 12.

What has been adjusted?

- Nil.

What has been added?

- Differentiation of e^x moves from *MA-E1 Logarithms and Exponentials*.
- Differentiation of $\operatorname{cosec} x$, $\sec x$ and $\cot x$.

What will teachers need to change if the Draft goes ahead as is?

- Include differentiation of e^x .
- Cover differentiation of the reciprocal ratios.

Probability

Summary

Probability has similar content to *S1.1: Probability and Venn diagrams* from *MA-S1 Probability and Discrete Probability Distributions* with some basic concepts not covered in syllabus but still needed. Experimental probability has been removed and Discrete probability distributions has moved to Year 12.

Overall *Probability* should take the same number of lessons to teach as was required to teach S1.1 for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Concepts and language associated with theoretical probability, relative frequency and the probability scale, and experimental probability removed.

What has been adjusted?

- Nil.

What has been added?

- Nil

What will teachers need to change if the Draft goes ahead as is?

- Remove experimental probability
- Mention the probability scale and language briefly

Year 12 Advanced Content

Trigonometric functions and graphs

Summary

Trigonometric functions and graphs has generally the same content as *MA-T3 Trigonometric Functions and Graphs* with the addition of the derivatives of the trig ratios of $f(x)$ which move from *MA-C2 Differential Calculus*.

Overall *Trigonometric functions and graphs* should take one more lesson to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- More detail has been given, in line with the changes to Graph transformations.

What has been added?

- Derivatives of trigonometric functions of $f(x)$ have moved from Differential calculus.

What will teachers need to change if the Draft goes ahead as is?

- Cover differentiation of trig ratios of $f(x)$.

Recurrence, sequences and series

Summary

Recurrence, sequences and series is similar to *M1.2: Arithmetic sequences and series* and *M1.3 Geometric sequences and series* from *MA-M1 Modelling Financial Situations*, with a little bit of extra work on recurrence relationships.

Recurrence, sequences and series has been divided into three content groups: Recurrence; Arithmetic sequences and series; and Geometric sequences and series.

Overall *Recurrence, sequences and series* should take the same number of lessons to teach as was required for M1.2 and M1.3 in the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- $\lim_{n \rightarrow \infty} r^n = 0$ for $|r| < 1$

What has been adjusted?

- The pronumerals a is used instead of T for terms, with a_1 now the first term.

What has been added?

- Recurrence is dealt with specifically, but should only take half a lesson.
- Infinite series of an arithmetic series has been added, though it is of little point.

What will teachers need to change if the Draft goes ahead as is?

- Cover the recurrence definitions
- Cover infinite arithmetic series

Financial mathematics

Summary

Financial mathematics is similar to *M1.1: Modelling investments and loans* and *M1.4: Financial applications of sequences and series* from *MA-M1 Modelling Financial Situations*, but written in a more straightforward way which should be easier to use.

Financial mathematics has been divided into three content groups Compound interest investments; Reducing balance loans; and Annuities.

Overall Financial mathematics should take the same number of lessons to teach as M1.1 and M1.4 required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- Nil.

What has been added?

- Nil

What will teachers need to change if the Draft goes ahead as is?

- Adjust lessons to include new definitions.

Integral calculus

Summary

Integral calculus is generally the same as *MA-C4 Integral Calculus* from 2017 with relatively minor changes. The trapezoidal rule is removed and we no longer look at estimation of areas under curves that cannot be integrated in the syllabus.

Integral calculus has been divided into three content groups The anti-derivative; The fundamental theorem of calculus; and Indefinite integrals..

Overall Integral calculus should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Trapezoidal rule is gone
- Estimating areas under curves that cannot be integrated in the syllabus is gone

What has been adjusted?

- Integrating with e^x and trig ratios don't mention use functions of $f(x)$. We await any changes to the reference sheet!
- A different version of the FTC has been used.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Remove Trapezoidal rule and estimating areas under some curves.

Applications of calculus

Summary

Applications of calculus is generally the same as *MA-C3 Applications of Differentiation* from 2017 with the addition of *C1.1 Rates of change with respect to time* which has been moved from Extension 1 Year 11 Rates of Change.

Applications of calculus has been divided into three content groups The first and second derivatives; Optimisation and Applications of differentiation and integration.

Overall *Applications of calculus* should take two more lessons to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Nil.

What has been adjusted?

- Nil.

What has been added?

- *C1.1 Rates of change with respect to time* has moved from Year 11 Rates of Change

What will teachers need to change if the Draft goes ahead as is?

- Move rates of change with respect to time from Year 11

Random variables

Summary

Random variables includes content from *S1.2: Discrete probability distributions* from *MA-S1 Probability and Discrete Probability Distributions* from Year 11 and *MA-S3 Random Variables*, though there is no longer any mention of the sample mean and standard deviation being estimates of the population mean and standard deviation.

Random variables has been divided into three content groups: Discrete random variables; Continuous random variables; and The normal distribution.

Overall *Random variables* should take three more lessons to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed from the 2017 topic(s)?

- Sample mean and standard deviation being estimates of the population mean and standard deviation

What has been adjusted?

- Nil.

What has been added?

- *S1.2: Discrete probability distributions* from *MA-S1 Probability and Discrete Probability Distributions* from Year 11 has been added.

What will teachers need to change if the Draft goes ahead as is?

- Leave sample mean and standard deviation in as a brief discussion.
- Move discrete probability distributions from Year 11.
- Check that definitions match.

Overview of the Changes to the Content

- The biggest change is the movement of some content between Extension 1 and Extension 2:
 - t -results, product to sum identities and integrating with $\sin^2 nx$ and $\cos^2 nx$ move to Further Integration in Extension 2.
 - Working with Cartesian equations in Projectile motion moves back to Extension 1 from Extension 2.
- *Rates of change with respect to time* moves to Advanced.
- *Combinatorics* splits into *Permutations and combinations* and *The binomial theorem*, with the pigeonhole principle being removed from the syllabus.
- Compound angle results (sum and difference of angles) and double angle results move to Year 12.
- Overall I am making an educated guess that the course can be taught in approximately five fewer lessons than the 2017 syllabus.

Year 11 Extension 1

- Within Year 11 Extension 1
 - *Working with Combinatorics splits into Permutations and Combinations* and *The binomial theorem*.
- From Year 12 Extension 1:
 - Nil.
- To Year 12 Extension 1:
 - *ME-T2 Further Trigonometric Identities* compound angle results (sum and difference) and double angle results move to Year 12 *Further trigonometric identities and equations*.
- To Advanced:
 - *C1.1: Rates of change with respect to time* moves from Extension 1 *ME-C1 Rates of Change* to *Advanced Applications of calculus* in Year 12.
- To Extension 2:
 - *ME-T2 Further Trigonometric Identities* t -results and product to sum identities move to Extension 2 *Further Integration*.

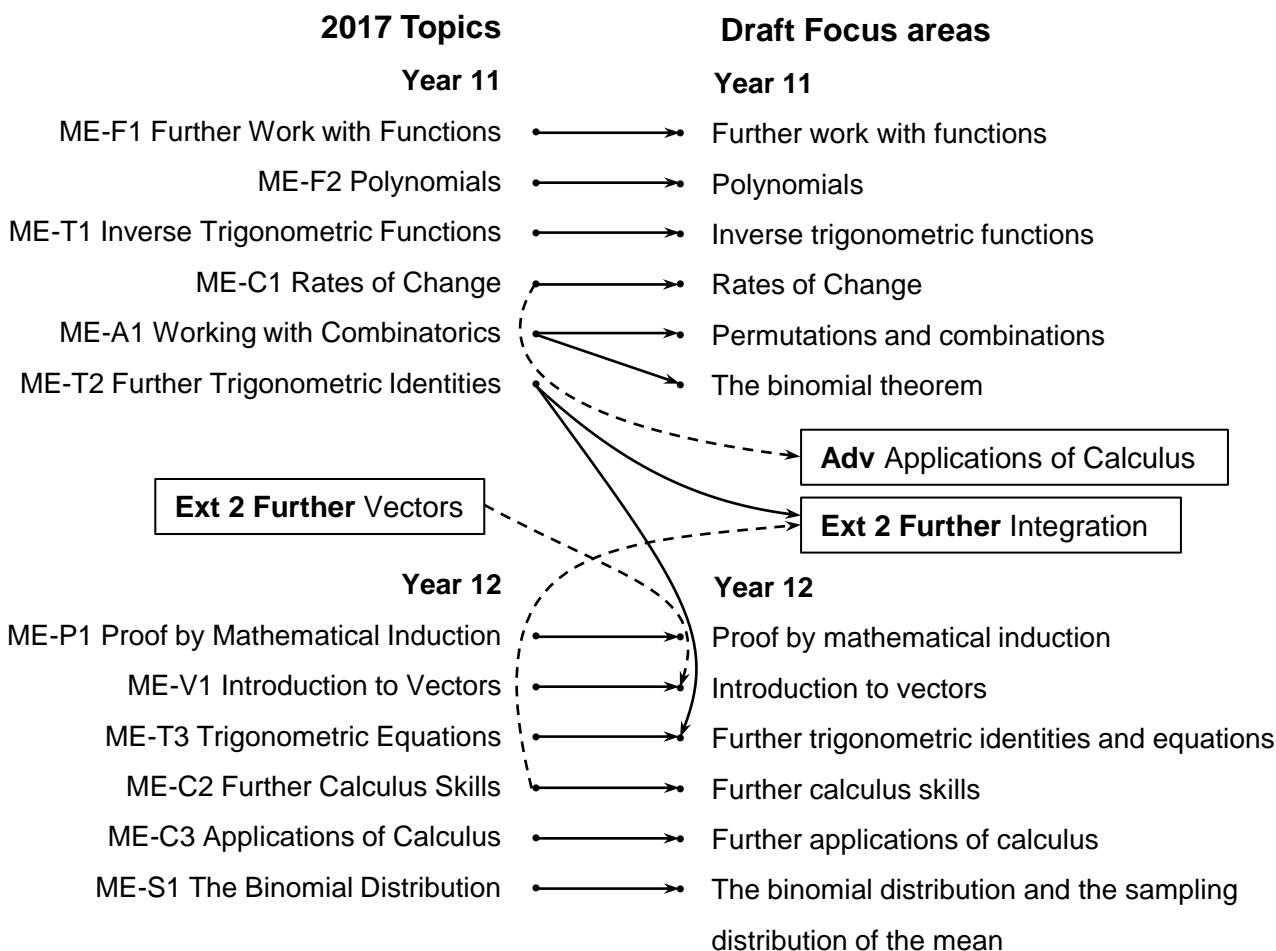
Year 12 Extension 1

- Within Year 12 Extension 1
 - Nil.
- From Year 11 Extension 1:
 - *ME-T2 Further Trigonometric Identities* compound angle results (sum and difference) and double angle results move to Year 12 *Further trigonometric identities and equations*.
- To Year 11 Extension 1:
 - Nil.
- To Extension 2:
 - *ME-C2 Further Calculus Skills* integrating with $\sin^2 nx$ and $\cos^2 nx$ move to Extension 2 *Further Integration*.
- From Extension 2:
 - Determining and using cartesian equations in projectile motion in *MEX-M1 Applications of Calculus to Mechanics M1.4: Projectiles and resisted motion* moves to *Introduction to Vectors*.

See the diagram of the changes next page.

Mapping the Changes

- > Solid arrow - all or half of the content moves here
 - - - - -> Dashed arrow - a small amount of content moves here



Internal Assessments

Year 11 Extension 1

- there are still 3 assessment tasks
- there is no requirement for an assignment or investigation-style task
- there is no limit on the number of formal examinations allowed in Year 11 (still one maximum in Year 12 though)
- the recommended weighting range of 20% to 40% is now a requirement

Year 12 Extension 1

- there are still a maximum of 4 assessment tasks
- there is no requirement for an assignment or investigation-style task
- only one formal examination is allowed in Year 12 (more than one is allowed in Year 11)
- the formal examination can be worth up to the task maximum of 40% (rather than the previous limit of 30%).
- the weighting range is still 10% to 40% and is still a requirement

HSC Examinations

Extension 1

- all examination details stay the same - exam and reading time length, number of marks in each section, the number of items, the number of 4 or 5 mark questions.

Year 11 Extension 1 Content

Further work with functions

Summary

Further work with functions is very similar to *ME-F1 Further Work with Functions* from the 2017 syllabus, with a couple of minor additions.

Further work with functions has been divided into four content groups: Graphical relationships; Inverse functions; Parametric form of a function or relation; and Inequalities.

Overall *Further work with functions* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed?

- Nil.

What has been adjusted?

- In graphical relationships the syllabus now clarifies that $y = f(x)$ can be given in graphical or algebraic form.

What has been added?

- In Inequalities students are now required to solve cubic inequalities, as well as quadratic inequalities.
- Problems based on functions and inverse functions mention the point of intersection of the two curves.

What will teachers need to change if the Draft goes ahead as is?

- Make sure that you include $y = f(x)$ in algebraic form
- Include the point of intersection of a function and its inverse in questions.
- Include some basic cubic inequalities.
- One-to-one functions have been removed from Advanced so need to be covered here.

Polynomials

Summary

Polynomials is very similar to *ME-F2 Polynomials* from the 2017 syllabus.

Polynomials has been divided into two content groups: Remainder and factor theorems; and Sums and product of roots of polynomials.

Overall *Polynomials* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed?

- Nil.

What has been adjusted?

- Some extra polynomial definitions that were probably covered by most teachers anyway.
- The remainder and factor theorems are to be used to solve 'related polynomial problems' rather than just equations.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Check that all polynomial definitions are already covered
- Include some 'related polynomial problems' for remainder and factor theorems.

Inverse trigonometric functions

Summary

Inverse trigonometric functions is similar to *ME-T1 Inverse Trigonometric Functions* with a small amount of extra material added to it, but many teachers will already be covering these anyway.

Year 11 Trigonometry also used to include *ME-T2 Further Trigonometric Identities* - this material has been split between Year 12 *Further trigonometric identities and equations* (compound angle and double angle results) and Extension 2 *Further integration* (*t*-results and Product to Sum Identities) in the draft syllabus.

Overall *Inverse trigonometric functions* should take four fewer lessons to teach than was required for the whole Year 11 Trigonometric Functions in the 2017 syllabus.

Detail

What has been moved or removed?

- Compound and double angle results to Year 12 *Further trigonometric identities and equations*.
- *t*-results and Product to Sum Identities to Ext 2 *Further integration*.

What has been adjusted?

- The syllabus includes both $y = \sin^{-1}(\sin x)$ and $y = \sin(\sin^{-1} x)$, and similarly for cosine and tangent.

What has been added?

- Classifying the inverse trigonometric functions as odd, even or neither.
- Transformations of the inverse trigonometric functions.

What will teachers need to change if the Draft goes ahead as is?

- Remove content from *ME-T2 Further Trigonometric Identities* to Yr 12 Ext 1 or Ext 2.
- Check that the odd/even/neither for inverse trigonometric functions is covered.
- Check that transformations of inverse trigonometric functions are covered.
- Check that both $y = \sin^{-1}(\sin x)$ and $y = \sin(\sin^{-1} x)$, and similarly for cosine and tangent, are covered.

Rates of change

Summary

Rates of change is quite similar to *ME-C1 Rates of Change* from the 2017 syllabus, though C1.1 Rates of change with respect to time which has been moved to Yr 12 *Advanced Applications of calculus*.

Rates of change has been divided into three content groups: Exponential growth and decay; Modified exponential growth and decay; and Related rates of change.

Overall *Rates of change* should take two fewer lessons to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed?

- *C1.1 Rates of change with respect to time* has been moved to Yr 12 *Advanced Applications of calculus*.

What has been adjusted?

- Related rates of change now mentions formulas relating to area, surface area or volume.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Move C1.1 Rates of change with respect to time to Yr 12 *Advanced Applications of calculus*.
- Check that questions on area, surface area and volume are included in Related rates of change

Permutations and combinations

Summary

Permutations and combinations is mainly A1.1: Permutations and combinations from *ME-A1 Working with Combinatorics* from the 2017 syllabus, with the pigeonhole principle removed.

Overall Permutations and combinations should take one less lesson to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed?

- The pigeonhole principle has been removed.

What has been adjusted?

- Justifying why $0! = 1$ is mentioned.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Make sure that $0! = 1$ is covered
- Remove questions on the PHP.

The binomial theorem

Summary

The binomial theorem is mainly A1.2: The binomial expansion and Pascal's triangle from *ME-A1 Working with Combinatorics* from the 2017 syllabus with some extra content included. It has more of the flavour of the old syllabus.

Overall *The binomial theorem* should take one more lesson to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed?

- Nil.

What has been adjusted?

- Expand $(a + b)^n$ for $n = 0, 1, \dots, 5$ instead of for 'small numbers' from 2017.
- Summation notation (sigma notation) is used.
- Find specific terms in the expansion.

What has been added?

- Binomial theorem is to be used to simplify expansions.
- Prove identities involving binomial coefficients by substituting, comparing coefficients or applying combinatorial arguments.
- Use identities to solve problems.

What will teachers need to change if the Draft goes ahead as is?

- Introduce summation notation if you weren't already using it.
- Check that there are enough questions of varying difficulty on coefficients.

Year 12 Extension 1 Content

Proof by mathematical induction

Summary

Proof by mathematical induction appears almost exactly the same as *ME-P1 Proof by Mathematical Induction* from the 2017 syllabus, with only a minor dot point being removed, however because of things that have been removed in Extension 1 and Extension 2 Induction there are more things to consider.

Overall Proof by mathematical induction should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed?

- Students no longer need to 'recognise situations where proof by mathematical induction is not appropriate'.

What has been adjusted?

- There is no mention of what values of n the base case involves in either Ext 1 or Ext 2, so assume any base from $n = 0$ up in both courses.
- There is no mention of step values other than 1 in either Ext 1 or Ext 2, so assume step values of 1 or 2 in both courses.
- Sigma notation is no longer mentioned in Ext 2, but appears as 'summation notation' in several topics in Advanced and Ext 1, so expect to see it induction on Ext 1 and Ext 2.

What has been added?

- Divisibility results are now only in Ext 1, so assume that the harder examples like $3^{2n+4} - 2^{2n}$ being divisible by 5 have also moved from Ext 2 to Ext 1.

What will teachers need to change if the Draft goes ahead as is?

- There is now only need to briefly mention situations where induction is inappropriate. This is still a good idea for Ext 2 students so that they are aware that if they need to prove a result for all real numbers that induction is not suitable.
- Include questions with base cases other than $n = 1$ and step values other than 1.
- Include summation notation.

Introduction to vectors

Summary

Introduction to vectors is largely based on *ME-V1 Introduction to Vectors* but with lots of changes in detail and moved content. In general this will make our teaching much easier.

Many of the definitions have been given more detail, including new notation or formulas.

Geometric proofs and forces are now only in Ext 2, which avoids the confusion that existed as to what needs to be covered in each course. Cartesian equations in projectile motion are now solely in Ext 1. The only projectile motion in Ext 2 is now when there is resistance.

Introduction to vectors has been divided into four content groups: Introduction to 2D and 3D vectors; Further operations with vectors; Motion in vector form in 2 dimensions; and Projectile motion.

Overall Introduction to vectors should take the same number of lessons to teach as was required for the 2017 syllabus. This opinion might change depending on how the material that is new or moved from Ext 2 fits together.

Detail

What has been moved or removed?

- Geometric proofs are now only in Ext 2 Vectors
- Force vectors are now only in Ext 2 Vectors

What has been adjusted?

- Many definitions have been given more detail.
- Focus on the xy plane within the 3D space (and xz and yz planes).
- $\text{proj}_{\mathbf{b}} \mathbf{a}$ notation introduced for projections.
- Formula for projection and the component perpendicular introduced.
- A lot more detail has been provided on motion in 2D.
- More detail has been added on projectile motion.

What has been added?

- Introduction to 3D vectors and operations with 3D vectors have been moved from Ext 2.
- Midpoint and distance formulas in 2D and 3D
- 'orthogonal' introduced instead of 'perpendicular' - does this apply to the zero vector?
- Finding the Cartesian path and associated questions have been moved from Ext 2 Mechanics.

Continued over page.

What will teachers need to change if the Draft goes ahead as is?

- There are so many changes that teachers will need to go through every dot point and check what is covered. Some of the things to look for are:
 - Remove questions on forces to Ext 2.
 - Remove questions on geometric proofs to Ext 2.
 - Move work on 3D from Ext 2 to Ext 1, or create it afresh.
 - Check that all definitions, notation and formula match those in the new syllabus.
 - Expand the lesson on motion in 2D.
 - Include cartesian equations in projectile motion.

Further trigonometric identities and equations

Summary

Further trigonometric identities and equations is mainly from ME-T3 Trigonometric Equations but also includes some content from ME-T2 Further Trigonometric Identities.

The first content group, Further trigonometric identities, used to be part of Yr 11 Trig in the [2017] syllabus. The work on compound angles and double angles has moved here while t -results and Product to Sum identities moves to Ext 2 Integration in the draft syllabus.

Further trigonometric identities and equations has been divided into two content groups: Further trigonometric identities; and Further trigonometric equations.

It is unclear whether 'prove and apply other trigonometric identities' from 2017 is covered in the draft syllabus.

Overall *Further trigonometric identities and equations* should take one or two more lessons to teach than was required for Year 12 Trigonometry in the 2017 syllabus.

Detail

What has been moved or removed?

- Maybe 'prove and apply other trigonometric identities' - to be confirmed.

What has been adjusted?

- Some wording in relation to equations and problems has changed, but is of no consequence.

What has been added?

- Compound angle and double angle results from 2017 Yr 11 ME-T2 *Further Trigonometric Identities*.

What will teachers need to change if the Draft goes ahead as is?

- Move compound angle and double angle lessons from Yr 11 to Yr 12.
- Possibly remove work on other trigonometric identities.

Further calculus skills

Summary

Further calculus skills is largely *ME-C2 Further Calculus Skills* from the 2017 syllabus. This focus area could probably be rewritten more succinctly - it takes at most 4 lessons, but possible only 3 lessons. It could also be recombined with Further applications of calculus.

Further calculus skills has been divided into two content groups: Derivatives of inverse functions; and Techniques of integration.

Overall Further calculus skills should take either the same number of lessons teach or one less lesson than was required for the 2017 syllabus.

Detail

What has been moved or removed?

- Integrating with $\sin^2 nx$ and $\cos^2 nx$ has been moved to Ext 2 Integration.

What has been adjusted?

- Nil.

What has been added?

- There is a dot point about using the product, quotient and chain rules which are mentioned throughout the Advanced syllabus, so perhaps this is an indication to focus on harder examples?

What will teachers need to change if the Draft goes ahead as is?

- Move questions on integrating with $\sin^2 nx$ and $\cos^2 nx$ to Ext 2.

Further applications of calculus

Summary

Further applications of calculus is almost identical to *ME-C3 Applications of Calculus* from 2017.

Further applications of calculus has been divided into two content groups: Further areas and volumes of solids of revolution; and Differential equations.

Overall Further applications of calculus should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed?

- Nil.

What has been adjusted?

- The logistic equation is no longer mentioned by name but still included in the second last dot point.

What has been added?

- Nil.

What will teachers need to change if the Draft goes ahead as is?

- Check that all definitions match the new syllabus.

The binomial distribution and sampling distribution of the mean

Summary

The binomial distribution and sampling distribution of the mean involves a mixture of old and new content. The first content group, *Bernoulli and binomial distributions*, is unchanged from S1.1: Bernoulli and binomial distributions in *ME-S1 The Binomial Distribution* from the 2017 syllabus. The second content group, *Sampling distribution of the mean and central limit theorem*, replaces *S1.2 Normal approximation for the sample proportion* - a sensible decision as it is much more useful.

The binomial distribution and sampling distribution of the mean has been divided into two content groups: Bernoulli and binomial distributions; and Sampling distribution of the mean and central limit theorem.

Overall *The binomial distribution and sampling distribution of the mean* should take either the same number of lessons or one more lesson to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed?

- *S1.2 Normal approximation for the sample proportion* is completely removed.

What has been adjusted?

- Nil.

What has been added?

- Sampling distribution of the mean and central limit theorem

What will teachers need to change if the Draft goes ahead as is?

- Check definitions for Bernoulli and Binomial distributions.
- Remove lesson on the sample proportion.
- Add a new lesson (or two) on Sampling distribution of the mean and central limit theorem.

Overview of the Changes to the Content

- The majority of the content of Mathematics Extension 2 remains the same
- Projectile motion without resistance moves to Extension 1
- t -results and product to sum results move from Extension 1.
- Overall I am making an educated guess that the course will need approximately an extra four lessons than the 2017 syllabus. This is an increase in teaching time of approximately 10%.

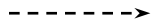
Year 12 Extension

- Within Year 12 Extension 2:
 - *MEX-N1 Introduction to Complex Numbers* and *MEX-N2 Using Complex Numbers* have been combined into *Introduction to complex numbers*.
- From Year 11 Extension 1:
 - *ME-T2 Further Trigonometric Identities* t -results and product to sum identities move to *Further integration*.
- From Year 12 Extension 1:
 - *ME-C2 Further Calculus Skills* integrating with $\sin^2 nx$ and $\cos^2 nx$ move to *Further integration*.
- To Year 12 Extension 1:
 - Determining and using cartesian equations in projectile motion from *MEX-M1 Applications of Calculus to Mechanics* moves to *Introduction to Vectors* in Extension 1 Year 12.

Mapping the Changes



Solid arrow - all or half of the content moves here



Dashed arrow - a small amount of content moves here

2017 Topics

Year 12

MEX-P1 The Nature of Proof

MEX-P2 Further Proof by Mathematical Induction

MEX-V1 Further Work with Vectors

MEX-N1 Introduction to Complex Numbers

MEX-N2 Using Complex Numbers

MEX-C1 Further Integration

MEX-M1 Applications of Calculus to Mechanics

Ext 1

Further Trigonometric Identities
Further Calculus Skills

Draft Focus areas

Year 12

The nature of proof

Further proof by mathematical induction

Further work with vectors

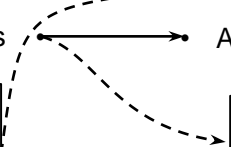
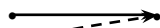
Introduction to complex numbers

Further integration

Applications of calculus to mechanics

Ext 1

Introduction to Vectors



Internal Assessments

Year 12 Extension 2

- there are still a maximum of 4 assessment tasks
- there is no requirement for an assignment or investigation-style task
- only one formal examination is allowed in Year 12
- the formal examination can be worth up to the task maximum of 40% (rather than the previous limit of 30%).
- the weighting range is still 10% to 40% and is still a requirement

HSC Examinations

Extension 2

- all examination details stay the same - exam and reading time length, number of marks in each section, the number of items, the number of 4 or 5 mark questions.

Year 12 Extension 2 Content

The nature of proof

Summary

The nature of proof is very similar to *MEX-P1 The Nature of Proof* with some extra content included in the last four dot points of Illustration of proofs, where we reintroduce inequality concepts from the old syllabus. The logic symbols for 'and' (\wedge) and 'or' (\vee) are mentioned in The language and notation of proof.

The nature of proof has been divided into two content groups: The language and notation of proof; and Illustrations of proofs.

Overall *The nature of proof* should take one more lesson to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed?

- Equality ($=$) is no longer mentioned, though still useful for students so I would still mention it in class
- All other 2017 content remains.

What has been adjusted?

- Most of the definitions in The language and notation of proof have been given more detail, which should help our teaching.
- Proof by contrapositive is mentioned.
- \forall and \exists are to be used for 'formulating propositions' - combined with the logic symbols for 'and; and 'or' does this mean more focus on the correct setting out of propositions?
- Taking reciprocals, squaring and multiplying inequalities are mentioned.

What has been added?

- The logic symbols for 'and' (\wedge) and 'or' (\vee) are mentioned.
- Extra content for inequalities from the old syllabus have been reintroduced:
 - Prove inequalities using geometry.
 - Prove results using the squeeze theorem.
 - Prove inequalities using calculus.
 - Prove results using properties of functions.

Continued over page.

What do teachers need to change in Extension 2 lessons & programs?

- Make sure all definitions are adjusted as needed.
- Add the symbols for 'and' (\wedge) and 'or' (\vee) if they are not already covered.
- Spend more time on the correct setting out of propositions??
- Add questions for the new content in the four dot points at the end - probably needs at least one more lesson in the scope and sequence.

Further proof by mathematical induction

Summary

Further proof by mathematical induction is similar to *MEX-P2 Further Proof by Mathematical Induction*. Divisibility results are now only covered in Extension 1. The base case and step value can take any values, which is also the case in Extension 1. Sigma notation is now called summation notation and appears in Advanced and both Extension courses.

Overall *Further proof by mathematical induction* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed?

- There is no mention of what values of n the base case involves in either Ext 1 or Ext 2, so assume any base from $n = 0$ up in both courses.
- There is no mention of step values other than 1 in either Ext 1 or Ext 2, so assume step values of 1 or 2 in both courses.
- Sigma notation is no longer mentioned in Ext 2, but appears as 'summation notation' in several topics in Advanced and Ext 1, so expect to see it induction on Ext 1 and Ext 2.
- Divisibility results are now only in Ext 1, so assume that the harder examples like $3^{2n+4} - 2^{2n}$ being divisible by 5 have also moved from Ext 2 to Ext 1.

What has been adjusted?

- 'results in algebra' from 2017 is now more specifically 'results involving trigonometric, exponential, polynomial or other identities'.
- 'results related to probability' from 2017 is not specifically mentioned but the example involving binomial theorem is.
- Examples for trigonometry and first-order recursive formula have been added.
- The example for geometric results has changed from the sum of the exterior angles of a convex polygon 2017 to the number of diagonals of a convex polygon $n \geq 4$.

What has been added?

- Nil.

What do teachers need to change in Extension 2 lessons & programs?

- Remove questions involving divisibility from Ext 2 and move them to Ext 1.

Further work with vectors

Summary

Further work with vectors is largely based on MEX-V1 Further Work with Vectors but with many changes of definitions or content. The emphasis in Ext 2 Vectors becomes working with lines and curves; geometric proofs; plus a greater emphasis on dot products. The introduction to 3D vectors has been moved to Ext 1. There is more detail given on the vector equations of lines, which will require only a little extra work beyond what we have already been doing. There is also more detail on dot products and triangle definitions.

Further work with vectors has been divided into two content groups: Vector equations of lines and curves; and Vectors and geometry.

Overall Further work with vectors should take one more lesson to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed?

- Introduction to 3D vectors and Further operations with 3D vectors is now in Ext 1. ([2017]: all of V1.1 and the majority of V1.2).

What has been adjusted?

- A lot of the definitions have been given more detail.
- Vectors are now typed in bold rather than with the tilde underneath - how will this affect marking?
- Skew lines in 3D are introduced

What has been added?

- Dot product calculations are made more specific - will this become more important?
- Dividing an interval internally in a ratio in vector form is introduced.
- Cauchy-Schwarz inequality for vectors is introduced - you have probably already covered this without knowing it had a name!
- Medians, altitudes, perpendicular bisectors and angle bisectors of a triangle mentioned - allows a wider variety of proofs.

What do teachers need to change in Extension 2 lessons & programs?

- Remove questions involving basic 3D vectors from Ext 2 and move them to Ext 1.
- Add content on dot product calculations, dividing an interval in a ratio, Cauchy-Schwarz inequality and triangle properties.

Introduction to complex numbers

Summary

Introduction to complex numbers is very similar to *MEX-N1 Introduction to Complex Numbers* and *MEX-N2 Using Complex Numbers* from 2017. The majority of the content has stayed the same and will require little change - most teachers will already be covering the slight additional content.

Complex Numbers has been consolidated into one focus area which is divided into four content groups: Arithmetic of complex numbers; Geometric representation of a complex number; Solving equation with complex numbers; and Geometrical implications of complex numbers.

Overall *Introduction to complex numbers* should take the same number of lessons to teach as was required for the 2017 syllabus.

Detail

What has been moved or removed?

- A couple of minor dot points that were specifically mentioned in 2017 have been removed but they are included in other dot points, so effectively no content has been removed.

What has been adjusted?

- A lot of definitions are reworded or given more detail.

What has been added?

- Set notation \mathbb{N} , \mathbb{Z} , \mathbb{Q} , \mathbb{R} and \mathbb{C} .

What do teachers need to change in Extension 2 lessons & programs?

- Check that the definitions in your lessons match those in the new syllabus.

Further integration

Summary

Further integration is largely based on *MEX-C1 Further Integration* but with the introduction of material from Extension 1, much of which involves solving trigonometric equations rather than integration. The 2nd, 3rd, 4th and 6th dot points have nothing to do with integration. There is much more detail provided on Integration in this draft syllabus than in the 2017 syllabus, which is great to see. There is still no mention of the reverse chain rule as an alternative to integration by substitution.

Overall Further integration should take three more lessons to teach than was required for the 2017 syllabus.

Detail

What has been moved or removed?

- Nil.

What has been adjusted?

- There is more detail on rational functions
- There is an emphasis toward the end on using integration in practical problems (other than Mechanics)

What has been added or moved from another syllabus?

- The following material has been moved from Ext 1:
 - Integrating integrands involving $\sin^2 nx$ and $\cos^2 nx$
 - Product to sum identities and applications to equations and integrals
 - t -results to solve equations
- There is more focus on questions involving multiple techniques of integration

What do teachers need to change in Extension 2 lessons & programs?

- Make sure that all details on rational functions are included in your notes
- Move the former Ext 1 material to Ext 2
- Ensure that you have enough questions that require more than one integration technique to solve.
- Ensure you have enough practical applications of integration (other than Mechanics).

Applications of calculus to mechanics

Summary

Applications of calculus to mechanics is quite similar to *MEX-M1 Applications of Calculus to Mechanics* from 2017. The majority of the syllabus remains the same, with some concepts given more detail. There are some minor additions that many of us already cover. Projectile motion without resistance has been moved to Ext 1 and quadratic drag with resisted projectile motion is excluded.

Mechanics has been divided into six content groups: Forces and further motion in a straight line; Simple Harmonic Motion; Modelling motion without resistance; Rectilinear resisted motion; Vertical resisted motion; and Projectiles and resisted motion.

Overall *Applications of calculus to mechanics* should take one lesson less to teach than the 2017 syllabus.

Detail

What has been moved or removed?

- Using parametric equations to find the cartesian equation of a projectile and using the cartesian equation to solve problems is removed to Ext 1.
- Quadratic drag for resisted projectile motion is excluded.

What has been adjusted?

- More detail is provided on many concepts.

What has been added or moved from another syllabus?

- The SHM formula $v^2 = n^2(A^2 - (x - c)^2)$ has returned to the syllabus.
- Smooth inclined planes and single pulleys are mentioned for motion without resistance.

What do teachers need to change in Extension 2 lessons & programs?

- Remove lesson on projectile motion without resistance from Ext 2 and move to Ext 1.
- Make minor changes to definitions in most lessons.
- Remove mention of quadratic drag from resisted projectile motion.