

Year 12 Mathematics with Calculus



St Andrew's College

Student Handout 2017:

Introduction

Programme of Learning

Assessment

Whāia te mātauranga hei orange mō koutou

Seek after learning for the sake of your wellbeing

Kia ora and welcome to Year 12 Mathematics with Calculus for 2017

Mathematics is the exploration and use of patterns and relationships in quantities, space, and time. Statistics is the exploration and use of patterns and relationships in data. These two disciplines are related but different ways of thinking and of solving problems. Both equip students with effective means for investigating, interpreting, explaining, and making sense of the world in which they live.

Mathematicians and statisticians use symbols, graphs, and diagrams to help them find and communicate patterns and relationships, and they create models to represent both real-life and hypothetical situations. These situations are drawn from a wide range of social, cultural, scientific, technological, health, environmental, and economic contexts.

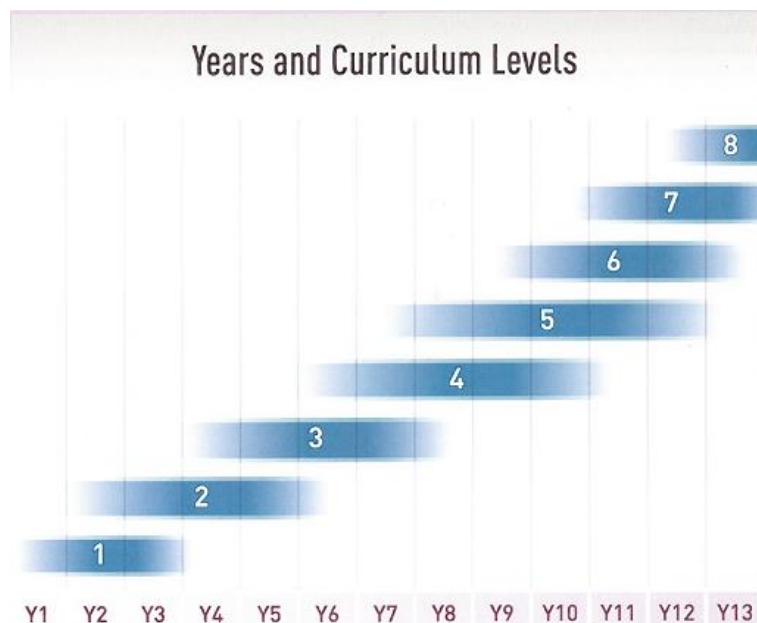
Learning area structure

The achievement objectives are presented in three strands. It is important that students can see and make sense of the many connections within and across these strands.

Number and algebra – Number involves calculating and estimating, using appropriate mental, written, or machine calculation methods in flexible ways. It also involves knowing when it is appropriate to use estimation and being able to discern whether results are reasonable. Algebra involves generalising and representing the patterns and relationships found in numbers, shapes, and measures.

Geometry and measurement – Geometry involves recognising and using the properties and symmetries of shapes and describing position and movement. Measurement involves quantifying the attributes of objects, using appropriate units and instruments. It also involves predicting and calculating rates of change.

Statistics involves identifying problems that can be explored by the use of appropriate data, designing investigations, collecting data, exploring and using patterns and relationships in data, solving problems, and communicating findings. Statistics also involves interpreting statistical information, evaluating data-based arguments, and dealing with uncertainty and variation. The diagram below shows how curriculum levels typically relate to years at school. In Year 12 Mathematics with Calculus your work will be assessed against Level 7 of the New Zealand Curriculum.



Key Learning Outcomes

In a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will solve problems and model situations that require them to:

For Mathematics:

Patterns and relationships:

Display the graphs of linear and non-linear functions and connect the structure of the functions with their graphs

Apply trigonometric relationships, including the sine and cosine rule, in two and three dimensions.

Equations and expressions:

Manipulate rational, exponential, and logarithmic algebraic expressions.

Form and use linear and quadratic equations.

Form and use pairs of simultaneous equations, one of which may be non-linear.

Calculus:

Sketch the graphs of functions and their gradient functions and describe the relationship between these graphs

Apply differentiation and anti-differentiation techniques to polynomials

For Statistics:

Investigate situations that involve elements of chance:

comparing theoretical continuous distributions, such as the normal distribution, with experimental distributions

calculating probabilities, using such tools as two-way tables, tree diagrams, simulations, and technology

Course Endorsement:

It is possible to gain Course Endorsement in Year 12 Mathematics with Calculus. Course endorsement provides recognition for a student who has performed exceptionally well in an individual course.

Students will gain an endorsement for a course if, in a single school year, they achieve:

- 14 or more credits at Merit or Excellence, and
- at least 3 of these credits are from the externally assessed Probability standard (4 credits) and 3 credits are from internally assessed standards.

Course Entry Requirements for Level Three Mathematics with Calculus 2018:

St Andrew's College offers a single Level Three Mathematics with Calculus course that follows on from Level Two.

13 Mathematics with Calculus:	12 credits in Level 2 Mathematics. At least a Merit grade in the Algebra (AS 91261) or Calculus (AS 91262) externals. This course progresses from the Year 12 Mathematics with Calculus course. This course should not be done in combination with .
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The School Examination results from Term Three will provide pre-entry into these courses. If you do not gain pre-entry, you will need to use your NZQA examination results and risk missing out on a place in a course if the classes are full.

Year 12 Mathematics and Statistics Programme 2017:

TERM I			TERM II			TERM III			TERM IV		
1	30-Jan to 3-Feb	Teacher Only Teacher Only Yr 9s only Student-Teacher Conferences	1	1-May to 5-May	Teacher Only 2.12 Probability (Con't)	1	24-Jul to 28-Jul	Teacher Only 2.7 Calculus	1	16-Oct to 20-Oct	
2	6-Feb to 10-Feb	Waitangi Day 2.4 Trigonometry	2	8-May to 12-May		2	31-Jul to 4-Aug		2	23-Oct to 27-Oct	
3	13-Feb to 17-Feb		3	15-May to 19-May		3	7-Aug to 11-Aug		3	30-Oct to 3-Nov	Labour day Study Leave Begins
4	20-Feb to 24-Feb	2.4 Internal Assessment 2.2 Graphing	4	22-May to 26-May	2.6 Algebra	4	14-Aug to 18-Aug		4	6-Nov to 10-Nov	NCEA Exams Start
5	27-Feb to 3-Mar		5	29-May to 2-Jun		5	21-Aug to 25-Aug		5	13-Nov to 17-Nov	Cant. Anniversary
6	6-Mar to 10-Mar		6	5-Jun to 9-Jun	Queens BDay	6	28-Aug to 1-Sep	All Internal Assessments finished	6	20-Nov to 24-Nov	
7	13-Mar to 17-Mar		7	12-Jun to 16-Jun		7	4-Sep to 8-Sep	Winter Tournament	7	27-Nov to 1-Dec	
8	20-Mar to 24-Mar	2.2 Internal Assessments	8	19-Jun to 23-Jun		8	11-Sep to 15-Sep		8	4-Dec to 8-Dec	Teacher Only Teacher Only
9	27-Mar to 31-Mar	2.12 Probability Summer Tournament	9	26-Jun to 30-Jun		9	18-Sep to 22-Sep	School Exams			
10	3-Apr to 7-Apr		10	3-Jul to 7-Jul				3 WEEKS BREAK			
		3 WEEKS BREAK			2 WEEKS BREAK						

Summary of Requirements for Level Two Standards

This section contains a summary of the expected outcomes for each of the Statistics Level Two Achievement Standards. The purpose of this summary is to give students a simplified and easily accessed idea of what will be assessed for each standard. These summaries in no way replace the actual Achievement Standards and it is assumed that teachers will both provide access to the standards and will fully explain the standards to the students during the normal teaching and learning process. Students will also have access to exemplars that indicate achievement levels for each assessment.

<i>Internal assessment credits</i>	<i>External assessment credits</i>
7	12

External Assessments:

The school examination will provide evidence for a derived grade for all external Achievement standards, should the need arise. Students will be summatively assessed in the NZQA external exam at the end of the year.

Mathematics with Statistics 91261/3: A.S 2.12 Apply algebraic methods in solving problems

External: 4 credits

This achievement standard is derived from Level 7 of The New Zealand Curriculum and is related to the achievement objectives

- manipulate rational, exponential, and logarithmic algebraic expressions
- form and use linear and quadratic equations

in the Mathematics strand of the Mathematics and Statistics Learning Area.

Methods include a selection from those related to:

- manipulating algebraic expressions, including rational expressions
- manipulating expressions with exponents, including fractional and negative exponents
- determining the nature of the roots of a quadratic equation
- solving exponential equations (which may include manipulating logarithms)
- forming and solving linear and quadratic equations

Mathematics with Statistics 91262/3: A.S 2.12 Apply calculus methods in solving problems

External: 5 credits

This achievement standard is derived from Level 7 of The New Zealand Curriculum and is related to the achievement objectives

- sketch the graphs of functions and their gradient functions and describe the relationship between these graphs
- apply differentiation and anti-differentiation techniques to polynomials

in the Mathematics strand of the Mathematics and Statistics Learning Area.

Methods include a selection from those related to:

- derivatives and anti-derivatives of polynomials given in expanded form
- gradient functions and function from a gradient function
- gradient at a point
- equation of a tangent
- turning points where $f'(x) = 0$ and their nature
- rate of change problems (such as kinematics)

Mathematics with Statistics 91267/3: A.S 2.12 Apply probability methods in solving problems

External: 4 credits

This achievement standard is derived from Level 7 of The New Zealand Curriculum and is related to the achievement objectives

- evaluate statistically based reports
 - interpreting risk and relative risk
- investigate situations that involve elements of chance
 - comparing theoretical continuous distributions, such as the normal distribution, with experimental distributions
 - calculating probabilities, using such tools such as two-way tables, tree diagrams

in the Statistics strand of the Mathematics and Statistics Learning Area.

Methods include a selection from those related to:

- risk and relative risk
- the normal distribution and experimental distributions
- relative frequencies
- two-way tables
- probability trees

Internal Assessments

Mathematics with Statistics 91257/3: A.S 2.2 Apply graphical methods in solving problems

Internal: 4 credits

This achievement standard is derived from Level 7 of The New Zealand Curriculum and is related to the achievement objectives

- display the graphs of linear and non-linear functions and connect the structure of the functions with their graphs
- form and use linear, quadratic, and simple trigonometric equations in the Mathematics strand of the Mathematics and Statistics Learning Area.

Problems are situations that provide opportunities to apply knowledge or understanding of mathematical concepts and methods. Situations will be set in real-life or mathematical contexts.

Methods include a selection from those related to:

- Quadratic, cubic, exponential, logarithmic, absolute value, trigonometric, piecewise, and hyperbolic graphs, their features and their equations.
- formations of graphs
- connecting different representations of relations
- properties of functions (may include domain and range).

Students will have the opportunity for formative assessment(s) before the actual NCEA summative task. There will be ONE reassessment opportunity for this standard, should a student not achieve the Standard or would like to improve their grade.

Mathematics with Statistics 91259/1: A.S 2.4 Apply trigonometric relationships in solving problems

Internal: 3 credits

This achievement standard is derived from Level 7 of The New Zealand Curriculum and is related to the achievement objective

- apply trigonometric relationships, including the sine and cosine rules, in two and three dimensions in the Mathematics strand of the Mathematics and Statistics Learning Area.

Problems are situations that provide opportunities to apply knowledge or understanding of mathematical concepts and methods. Situations will be set in real-life or mathematical contexts.

Methods include a selection from those related to:

- length of an arc of a circle
- area of a sector of a circle
- sine rule
- cosine rule
- area of a triangle

Students will have the opportunity for formative assessment(s) before the actual NCEA summative task. There will be ONE reassessment opportunity for this standard, should a student not achieve the Standard or would like to improve their grade.

12 Mathematics with Calculus: How am I going?

Below is some space for you to track your achievement in this course.

INTERNAL SUMMATIVE ASSESSMENTS

Topic	1 st Assessment	Reassessment (if sat)	Final (best) Grade
2.4 Trigonometry			
2.2 Graphing			

EXTERNAL FORMATIVE ASSESSMENT

Topic	School Prelim (derived grade)
2.6 Algebra	
2.7 Calculus	
2.12 Probability	

Course Endorsement: *am I on track?*

What do I need? 14 or more credits at Merit or Excellence at the lower level supports endorsement

What have I got?

At least 3 credits from internally assessed standards	Total of internal <i>Merit</i> credits achieved	Total of internal <i>Excellence</i> credits achieved
At least 3 credits from externally assessed standards	Total of internal <i>Merit</i> credits needed	Total of internal <i>Excellence</i> credits needed

Assessment Policy A –Z: 2017

The Mathematics Department's Assessment Policy is as follows:

Assessment tasks: Where possible, you will be offered a range of activities for internal standards and the teacher will teach generic skills, which you will be able to apply to that context.

Appeals: You are welcome to appeal your grade. This appeal needs to have the accompanying paperwork (see your teacher for this) and should be handed into the classroom teacher, who will confer with the moderator of that assessment. If the appeal decision is still not accepted, the decision will lie with the Head of Department.

Authenticity: We are required to have procedures in place to ensure that *we know that you have completed your assessed work on your own*. This means that any internal assessment task will be carried out under teacher supervision. The Statistics based standards are assessed through a written report done over a week. There will be checkpoints for the statistics reports to ensure students are on track. If a checkpoint is missed, your classroom teacher will contact your parents / caregivers.

Due dates: The due date for the Statistical internal assessment will be published on the school's NCEA calendar and you are expected to adhere to this date. No late submissions will be accepted unless they are accompanied by a medical certificate or an extension has been granted prior. If you are absent the week of the assessment, please contact your Mathematics teacher.

Extensions: Extensions will be granted on an individual basis when necessary. Application must be made in writing to the Head of Teaching and Learning (Mr David Bevan) at least two weeks prior to the assessment due date.

Feedback: The practice assessments for all standards are your official opportunities to receive feedback. It is important you make the most of these formative assessment tasks.

Moderation: As a department, we need to ensure that all work is marked to the same standard. Because of this, samples of your work will be given to a senior member of the department to check for consistent marking.

'Not Achieved' versus 'void': Because all internal Statistics assessments use class time, any student who does not hand in / perform a completed internal assessment by the due date will receive a *Not Achieved* grade. Unless notification as to why the assessment will not be completed is given prior to the due date and given approval by the Head of Department, you will receive a *Not Achieved* grade.

Plagiarism: Using or copying other people's work is plagiarism. This can be from another student or text, including a website or secondary text. It is treated very seriously and any suspected plagiarism will be referred to the Head of Department or to the Head of Teaching and Learning. If you are found to have plagiarized or copied other people's work or sections of other people's work and handed it in as your own, the outcome will be a *Not Achieved* for that assessment, along with other disciplinary action.

Pre-entry into 2018 courses: Pre-entry into 2018 courses will be granted on the basis of Common Test results and preliminary examinations. If you do not gain pre-entry, you will need to use your NZQA examination results and risk missing out on a place in a course if the classes are full.

Resubmission: Resubmission are only available for Report based (Statistics) internals but not test based Mathematics internals. Resubmissions will happen by invitation-only and be based on the need for you to demonstrate a specific aspect of the criteria. As per NZQA guidelines, you will receive very limited feedback prior to this resubmission. Resubmissions will not be granted if you have a lot of work to do to achieve the standard.

Reassessment: Reassessments are only available for test based mathematics internals but not Report based (Statistics) internals. You may have one reassessment opportunity only.

School Examination: School Examination results will be used for NCEA derived grades.

Subject Prizes: The following grades will be used to calculate the end of year Prize Winner in each subject: *School Examination results, internal assessment results, Common text results completed in exam conditions.*

Signatures: You will be required to sign that the work completed is your own when you submit your work. Your signature is also required to confirm the grade received is correct. Signing something means you have read and accept responsibility for your work and grade.

Storage of work: All work that is handed in for internal assessment will be kept by your class teacher and stored by the Mathematics Department for the following year.

Please sign: I have read and understand the Mathematics Department's NCEA policy guidelines above:

Student name : _____ signature: _____

Parent / caregiver: _____

Date: _____ 2017

Your Mathematics teacher will give you another copy of this handout and keep it with your assessment material once you have signed it.