

Year 12 Mathematics and Statistics



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 and Statistics 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.

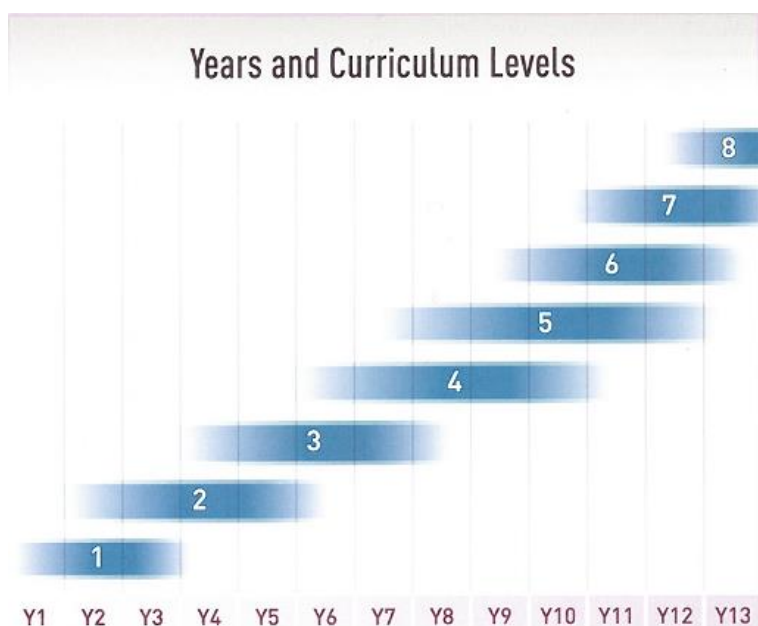
Learning area structure

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 and Statistics 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:

Apply co-ordinate geometry techniques to points and lines.

Choose appropriate networks to find optimal solutions.

Equations and expressions:

Manipulate algebraic expressions.

Form and use linear and quadratic equations.

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

For Statistics:

Carry out investigations of phenomena, using the statistical enquiry cycle:

conducting surveys that require random sampling techniques, conducting experiments, and using existing data sets

evaluating the choice of measures for variables and the sampling and data collection methods used

using relevant contextual knowledge, exploratory data analysis, and statistical inference.

make inferences from surveys and experiments:

making informal predictions, interpolations, and extrapolations

using sample statistics to make point estimates of population parameters

recognising the effect of sample size on the variability of an estimate.

Evaluate statistically based reports:

interpreting risk and relative risk

identifying sampling and possible non-sampling errors in surveys, including polls.

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.

Learning Values at St Andrew's College

The New Zealand Curriculum identifies five key competencies that people use to live, learn, work, and contribute as an active member of their communities. St Andrew's College has developed these as four *Learning Values*. Successful learners make use of and develop these. Each report will be an opportunity to give you feedback on how well you are doing with them. You will also have opportunities to reflect on your own progress with these values.

Strive to Achieve: *How determined are you to learn and achieve results that reflect your best efforts?*

- You focus on learning activities consistently and are rarely distracted.
- You behave consistently and appropriately in class settings, regardless of what is going on around you.
- You work hard to set and achieve results that reflect your best efforts.
- You are not put off by setbacks and failures. You know these are a normal part of the learning process.
- You demonstrate a desire to improve and develop as a learner.
- You create additional learning opportunities for yourself because you know that, to learn and remember things, you need to practise what you have learned in the classroom.

Think: *How much do you think about what you learn and how you learn it?*

- You have a natural curiosity in the subject and are interested in your learning.
- You can make new information by linking ideas.
- You ask questions to gain more knowledge and help create new information.
- You demonstrate effective critical thinking, questioning the reliability of all information.
- You use a range of thinking strategies without teacher direction and can work out which works best for you as a learner.
- You reflect on how well you have learned, use your reflections to do better in future attempts, and act successfully.

Collaborate: *How well do you learn with and from other people?*

- You participate and contribute to all group activities in lessons and are a positive influence in groups and in the classroom.
- You understand and can explain how your actions contribute to a learning outcome.
- You interact positively with a diverse range of people in a variety of contexts and you actively listen, recognise different viewpoints, negotiate and share ideas.
- You are open to new ideas, approaches, and ways of thinking.

Organise: *How organised are you with your own and others' equipment and learning?*

- You manage time and equipment effectively, in and out of class and can cope under the pressure of assessment.
- You meet deadlines and are able to communicate any issues with your teacher.
- You always have the right equipment for lessons.
- You understand and can explain how being organised contributes to your learning outcomes.

Course Endorsement:

It is possible to gain Course Endorsement in Year 12 Mathematics and Statistics. 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 and Statistics 2018:

St Andrew's College offers two different Level Three Mathematics and Statistics courses, all offering Achievement Standards and all 'approved' subjects for university entrance. The requirements for entry into these course are as follows:

| | |
|--|---|
| 13 Mathematics with Statistics: | 12 credits in Level 2 Mathematics. At least a Merit grade in the Probability (AS 91267) external. Students from Level 2 Mathematics with Statistics should also aim for a Merit grade in the Inference (AS 91264) internal. This course progresses from the Year 12 Mathematics and Statistics course. This course should not be done in combination with 13 Statistics. |
| 13 Statistics: | 12 credits in Level 2 Mathematics. At least a Merit grade in the Probability (AS 91267) external. Students from Level 2 Mathematics with Statistics should also aim for a Merit grade in the Inference (AS 91264) internal. This course is for students interested in a deeper understanding of Statistics alone. It is a course designed to complement those students intending to sit Scholarship Statistics. This course should not be done in combination with 13 Mathematics and Statistics. |

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.

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> |
|------------------------------------|------------------------------------|
| 13 | 4 |

External Assessments:

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

External: 4 credits

This achievement standard requires you to evaluate statistically based reports by interpreting risk and relative risk. You will also need investigate situations that involve elements of chance by:

- comparing theoretical continuous distributions, such as the normal distribution, with experimental distributions
 - calculating probabilities, using such tools such as two-way tables, tree diagrams
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- This standard will be study in term three, directly before the school examinations.
 - The school examination will provide evidence for a derived grade for this topic, should the need arise.
 - Students will be summatively assessed in the NZQA external exam at the end of the year.

Internal Assessments

Mathematics with Statistics 91256/3: A.S 2.1 *Apply co-ordinate geometry methods in solving problems* **Internal: 2 credits**

This achievement standard requires you to use a range of methods to describe triangles / quadrilaterals. Methods include a selection from those related to:

- distance between points
- midpoints
- the gradient of a line
- the equation of a line
- parallel, perpendicular and intersecting lines.

- 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 91260/1: A.S 2.5 *Using networks in solving problems*

Internal: 2 credits

This achievement standard requires you to choose appropriate networks to find optimal solutions on a graph. Most situations will have a real-life context. Methods include a selection from those related to:

- shortest path
- traversability
- minimum and maximum spanning tree

- 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 91264/3: A.S 2.9 *Use statistical methods to make an inference*

Internal: 4 credits

This standard involved using each component of the statistical enquiry cycle to make an inference. This involves:

- posing an appropriate investigative comparison question from a given set of population data
- selecting random samples
- selecting and using appropriate displays and measures
- discussing sample distributions
- discussing sampling variability, including the variability of estimates
- making an inference
- communicating findings in a conclusion.

- Students will have the opportunity to write a practice report for formative assessment before the actual NCEA summative task.
- There will be a resubmission opportunity for this standard should a student fall slightly short of a grade.
- There will not be a reassessment opportunity for this standard.

Mathematics with Statistics 91265/3: A.S 2.10 Conduct an experiment to investigate a situation using statistical methods

Internal: 3 credits

This standard requires you to investigate a situation by experiment using each component of the statistical enquiry cycle:

- posing an investigative question about a given experimental situation
- planning the experiment by
 - determining appropriate variables and measures
 - determining data collection and recording methods
- conducting the experiment and collecting data
- selecting appropriate displays and measures
- discussing displays and measures
- communicating findings in a conclusion.

- Students will have the opportunity to write a practice report for formative assessment before the actual NCEA summative task.
- There will be a resubmission opportunity for this standard should a student fall slightly short of a grade.
- There will not be a reassessment opportunity for this standard.

Mathematics with Statistics 91269/3: A.S 2.14 *Apply systems of equations in solving problems*

Internal: 2 credits

This achievement standard requires you to use a range of methods to solve a pair of simultaneous equations. Methods include a selection from those related to:

- forming and using a pair of simultaneous equations, one of which is non-linear
- forming and using a system of linear inequations
- connecting different representations of equations or inequations
- interpreting solutions of a system of equations or inequations in context.

- 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 and Statistics: 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 |
|---------------------------------|----------------------------|-----------------------|--------------------|
| 2.1 Co-ordinate Geometry | | | |
| 2.14 Systems of Equations | | | |
| 2.9 Statistical Inference | | | |
| 2.10 Statistical Experiments | | | |
| 2.5 Networks | | | |

EXTERNAL FORMATIVE ASSESSMENT

| Topic | School Prelim (derived grade) |
|---------------------|-------------------------------|
| 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.