

FIELD SCIENCES**Review, Rollover, Revision and AMAP Change of *Mathematics and Statistics and Probability* unit standards**

Subfield	Domain	Id
Mathematics	Algebra	5246, 5267, 5272, 11102, 11106, 11107, 11108, 11112, 11117, 12337-12345
	Calculus	5244, 5260, 5261, 5265, 5266, 11104, 11105, 11109-11111, 11113-11116
	Geometry	5231, 5245, 5252, 5269
	Mathematical Studies	12318-12330
	Measurement	5228, 5241, 8492
	Number	5224, 5225, 5227, 5234, 5235, 8489 - 8491, 12331, 12346
	Trigonometry	5236, 5251, 5255, 5268, 11103
Statistics and Probability	Probability	5250, 7571, 12347
	Statistics	5230, 5257, 11118-11130, 12332-12335

The NZQA National Qualifications Services (NQS) has completed the review, revision and rollover of the unit standards listed above that were registered in August 1995, May 1996, August and September 1997, and November 1999.

This report is in two sections:

- The first deals with the unit standards that have been reviewed, and the new unit standards that arose out of the review process.
- The second deals with the rollover and revision of the remaining unit standards.

Section 1 Reviewed unit standards

The following unit standards were reviewed.

Subfield	Domain	Id
Mathematics	Algebra	5246, 5267, 5272
	Calculus	5244, 5260, 5261, 5265, 5266, 11104, 11105
	Geometry	5231, 5245, 5252, 5269
	Mathematical Studies	12328-12330
	Measurement	5228, 5241, 8492
	Number	5224, 5225, 5227, 5234, 5235, 8489-8491, 12331, 12346
	Trigonometry	5236, 5251, 5255, 5268
Statistics and Probability	Probability	5250, 7571
	Statistics	5230, 5257, 11119, 11122, 11123, 12335

Date new versions published	June 2004
New comments by date	June 2008
Expiry date of new versions of the unit standards	December 2009

Summary of review and consultation process

NQS decided in late 2002 that a review of unit standards in these two subfields was necessary because

- feedback through the moderation process had indicated the need for changes to a number of the unit standards, and
- a number of the unit standards, some of which did not meet technical quality criteria, reached their expiry date in December 2002.

Some further recommendations for change came through the consultation process when NQS notified stakeholders of the review and invited feedback.

A review panel with secondary school and tertiary provider representation met on 30 April and 1 May 2003 to consider the proposed changes. Overlaps with achievement standards were also considered. Review outcomes were subsequently circulated widely to schools and tertiary providers, with drafts of the reviewed unit standards provided on request and also placed on the New Zealand Association of Mathematics Teachers website. Industry training organisations whose qualifications may have been affected by the review were also invited to respond, as was anyone who had indicated an interest in the review when it was first initiated. The provider who had reported results for the unit standard designated Category D was also consulted.

Feedback from this consultation was considered by the panel and has informed the new versions of the unit standards. In all, 42 unit standards were reviewed, 5 new unit standards were developed, and 47 unit standards were rolled over and revised.

Main changes resulting from the review

Levels and credits were reviewed in the light of their outcomes and content, and any overlaps with achievement standards were identified. The exclusions list on the NCEA website (<http://www.nzqa.govt.nz/ncea/acrp/secondary/7/731.html>) has been updated. Relationships with *Mathematics in the New Zealand Curriculum* objectives were confirmed. The following changes were made.

- Unit standards 5228, 5246, 5257, 5265, 11104, 11105 increased in credits.
- Unit standards 5267 and 12329 decreased in credits.
- Unit standards 5252, 5255, 5260, 5261, 5265, 5267, 5268, 5272, 11119, 11122, and 11123 decreased in level.

Other changes include the following.

- Unit standards 5227, 5228, 5231, 5236, 5245, 5251, 5255, 5261, 5265, 5268, 5269, 5272, 11123, 12335, and 12328-12330 have had changes in title.
- Unit standard 5266 was designated Category C and has been replaced by unit standards 20660 and 20905.
- Unit standard 12346 was designated Category D and will expire.
- Estimation requirements have been removed from unit standard 8492, and two new unit standards for estimation have been developed (20662 and 20663).
- Many unit standards have had changes to assessment notes, elements and/or performance criteria in order to make them more flexible, to clarify assessment requirements, to avoid overlap with other unit standards, and/or to achieve consistency with the stated level.
- Unit standards 8491, 8492, 11105 and 11119 now include a special note showing the relationship between each unit standard's outcomes and Mathematics in the New Zealand Curriculum objectives. This is in keeping with other curriculum-based Mathematics unit standards.
- Definitions of 'problem' and 'strategy' have been included (or referenced), where appropriate.
- Relationships between some of the level one unit standards have been clarified in a special note.
- Recommended competency advice has been moved from entry requirements to special notes.
- Minor corrections and editorial amendments have been made.

Unit standards 20659, 20660, 20661, 20662 and 20663 have been developed to fill identified gaps.

Unit standards categorised as category C or D expire at the end of December 2005.

Unit standard 5266 has been designated Category C.
Unit standard 12346 has been designated Category D.

Impact on existing provider accreditations

None.

Impact on Accreditation and Moderation Action Plan (AMAP)

Apart from unit standard 12346, designated review category D, all of the reviewed unit standards are now included on Accreditation and Moderation Action Plan (AMAP) 0226, which covers domains designated as Base Scope of Accreditation for Schools (BSAS)¹. This AMAP now includes all *Mathematics* and *Statistics and Probability* unit standards from levels 1-4.

¹ Base Scope of Accreditation for Schools (BSAS) was formerly known as 'Conventional School Subjects' (CSS).

Impact on existing qualifications

The following National Qualifications Services qualifications are affected by the outcome of this review. Because attainability of the qualifications is not affected, the changes to the mathematics unit standards will be taken into account at the next review/revision of the qualifications.

Qualification Title	Id
National Certificate in Rigging with strands in Basic Rigging, Intermediate Rigging, and Advanced Rigging [Ref: 0111]	5228, 5236
National Certificate in Scaffolding with strands in Advanced Scaffolding, Basic Scaffolding, and Suspended Scaffolding [Ref: 0110]	5228

The following qualification is also affected by the outcome of this review. The standard setting body (SSB) has been advised that it requires revision.

Qualification Title	Id	SSB Name
National Diploma in Civil Engineering [Ref: 0881]	5265, 5268, 5269, 5272, 11104, 11105, 11112	InfraTrain New Zealand

The following qualifications are not materially affected by the changes. They will be updated when they are next reviewed or revised.

Qualification Title	Id	SSB Name
National Certificate in Cranes (Mobile Crane Dispatch Supervision) [Ref: 0119]	5228, 5236	Power Crane Association ITO
National Certificate in Cranes (Mobile Crane Supervision) [Ref: 0118]	5228, 5236	Power Crane Association ITO
National Certificate in Cranes (Tower Crane Supervision) [Ref: 0120]	5228, 5236	Power Crane Association ITO
National Certificate in Elementary Construction Skills with strands in Entry Level, and Advanced Level [Ref: 0751]	5228, 5241	Building and Construction ITO
National Certificate in Engineering Machining and Toolmaking (Level 4) [Ref: 0123]	5228, 5251	Competenz
National Certificate in Engineering and Technology (for the Design and Construction Sector) [Ref: 0672]	5260, 5261, 5244	InfraTrain New Zealand
National Certificate in Engineering and Technology (Glass Containers) (Level 2) [Ref: 0947]	5228	PaMPITO
National Certificate in Furniture Finishing (Level 2) [Ref: 0790]	5228, 5225	NZ Furniture ITO
National Certificate in Furniture Finishing (Level 4) [Ref: 0092]	5228, 5225	NZ Furniture ITO

Qualification Title	Id	SSB Name
National Certificate in Maintenance and Diagnostics in Mechanical Engineering (Level 4)[Ref: 0125]	5228, 5251	Competenz
National Certificate in Metal Casting (Technology) (Level 4) [Ref: 0129]	5228, 5251	Competenz
National Certificate in Wastewater Treatment (Site Operator) [Ref: 0879]	5228, 5241	Agriculture ITO
National Certificate in Water Treatment (Site Operator) [Ref: 0880]	5228, 5241	Agriculture ITO

Summary of main changes to standards' Ids, classification, titles, levels, and credits

The following summary shows the changes made to the standards as a result of the review. All changes are in **bold**.

Key to review category

- A** Dates changed, but no other changes are made - the replacement standard carries the same Id and a new version number
- B** Changes made, but the overall outcome remains the same - the replacement standard carries the same Id and a new version number
- C** Major changes that necessitate the registration of a replacement standard with a new Id
- D** Standard will expire and not be replaced

Subfield Mathematics
Domain Algebra

Id	Title	Level	Credit	Review category
5246	Manipulate algebraic expressions and use algebraic methods to solve problems	2	3 4	B
5267	Use complex numbers to solve problems	4 3	4 3	B
5272	Use functions and their graphs to model situations Use functions and their graphs to model situations and solve problems	4 3	4	B

Domain Calculus

Id	Title	Level	Credit	Review category
5244	Demonstrate calculus skills	2	2	B
5260	Find and use derivatives to solve problems involving rate of change	3 2	2	B
5261	Use integral calculus to solve problems Find and use integrals to solve problems	3 2	2	B
5265	Differentiate functions and use calculus to solve problems Differentiate functions and use differentiation to solve problems	4 3	5 6	B

Id	Title	Level	Credit	Review category
5266	Use calculus to solve problems in integration and differential equations	4	7	C
20905	Integrate functions and use integration to solve problems	3	5	
11104	Use integration techniques to model and solve problems	4	2 3	B
11105	Use differential equations to model, solve, and interpret physical situations Use differential equations to model, solve and interpret physical situations	4	2 3	B

Domain Geometry

Id	Title	Level	Credit	Review category
5231	Use constructions and drawings Use constructions and make drawings for geometrical situations	1	2	B
5245	Solve problems involving lines and points Solve coordinate geometry problems	2	2	B
5252	Derive angle properties of circles and use them to solve mathematical problems	2 1	3	B
5269	Investigate and use the mathematics of conic sections and other curves Apply mathematics to conic sections and other curves	4	4	B

Domain Mathematical Studies

Id	Title	Level	Credit	Review category
12328	Describe the history of a mathematical topic or mathematician Demonstrate knowledge of the history of a mathematical topic or mathematician	1	2	B
12329	Research and report on an aspect of the history of a topic in mathematics Investigate an aspect of the history of a mathematics topic or mathematician and present results	2	3 2	B
12330	Research and analyse an aspect of the history of mathematics Plan and analyse research on an aspect of mathematics	3	3	B

Domain Measurement

Id	Title	Level	Credit	Review category
5228	Take measurements and use them in calculations to solve problems Take measurements and use calculations to solve measurement problems	1	2 3	B
5241	Use strategies to solve measurement problems	1	3	B
8492	Use standard units of measurement	1	3	B

Domain Number

Id	Title	Level	Credit	Review category
5224	Use decimals and percentages to solve problems	1	2	B
5225	Use fractions, ratio, and proportion to solve problems	1	2	B
5227	Solve problems involving time and money Solve problems involving money	1	3	B
5234	Use calculations in money situations	1	3	B
5235	Use strategies to solve number problems	1	2	B
8489	Solve problems which require calculation with whole numbers	1	2	B
8490	Solve problems using calculations with numbers expressed in different forms	1	2	B
8491	Read and interpret information presented in tables and graphs	1	2	B
12331	Investigate and report on the mathematics of a given project	2	3	B
12346	Represent numbers and carry out calculations in different number systems	5	3	D

Domain Trigonometry

Id	Title	Level	Credit	Review category
5236	Use Pythagoras' Theorem and trigonometry to solve problems involving right-angled triangles Use Pythagoras' Theorem and trigonometry to find unknowns in right-angled triangles	1	2	B
5251	Solve problems modelled by triangles Choose and apply trigonometric methods to solve problems involving lengths and angles	2	3	B
5255	Use trigonometry to solve problems Use trigonometry and trigonometrical graphs to solve equations and problems	3 2	3	B
5268	Manipulate trigonometric expressions, solve equations and sketch graphs Manipulate trigonometric expressions, sketch graphs of trigonometric functions, and solve equations	4 3	4	B

Subfield Statistics and Probability
Domain Probability

Id	Title	Level	Credit	Review category
5250	Use probability techniques to solve problems	2	2	B
7571	Use simulation techniques to determine probability and solve problems	1	2	B

Domain Statistics

Id	Title	Level	Credit	Review category
5230	Carry out a statistical investigation and interpret data	1	3	B
5257	Investigate time series	3	2 3	B
11119	Investigate relationships between pairs of quantitative variables	4 3	4	B
11122	Explain sampling distributions and estimate population parameters from large simple random samples	5 4	3	B
11123	Explain sampling distributions and estimate population parameters from small simple random samples Make point estimates from population parameters using small samples and find confidence intervals	5 4	3	B
12335	Demonstrate understanding of hypothesis testing and its use in different contexts Use hypothesis testing on means or proportions and draw conclusions	4	3	B

New unit standards

The following new unit standards were developed to fill gaps identified by the review process.

Subfield Mathematics
Domain Algebra

id	Title	Level	Credit
20659	Demonstrate basic algebra skills	1	2

Domain Calculus

Id	Title	Level	Credit
20660	Use integral calculus to solve differential equation problems	3	2

Domain Geometry

Id	Title	Level	Credit
20661	Sketch, describe and find equations of graphs	3	2

Domain Measurement			
Id	Title	Level	Credit
20662	Make estimates of measurements with common units	1	2

Domain Number			
Id	Title	Level	Credit
20663	Use a strategy to estimate the solution to number problems	1	2

Section 2 Revised and rolled over unit standards

The following unit standards, which were not included in the review, have been revised and rolled over.

Subfield	Domain	Id
Mathematics	Algebra	11102, 11106, 11107, 11108, 11112, 11117, 12337-12345
	Calculus	11109-11111, 11113-11116
	Mathematical Studies	12318-12327
	Trigonometry	11103
Statistics and Probability	Probability	12347
	Statistics	11118, 11120, 11121, 11124-11130, 12332, 12333, 12334

The NZQA National Qualifications Services decided that the unit standards should have their period of registration extended because they have not been used sufficiently to warrant a review at this stage.

A review of these unit standards is expected to take place during 2007.

Date new versions published **June 2004**

New comments by date **December 2006**

Expiry date of new versions of the unit standards **December 2007**

Main changes resulting from the revision

- Minor amendments to some unit standards were made to correct errors and inconsistencies and update references to other unit standard titles.
- Minor editorial amendments were made to most unit standards.
- The accreditation and moderation options were updated.

Impact on existing provider accreditations

None.

Impact on Accreditation and Moderation Action Plan (AMAP)

The following unit standards are now included on Accreditation and Moderation Action Plan (AMAP) 0226, which covers domains designated as Base Scope of Accreditation for Schools (BSAS) for which NZQA is the standard setter. This AMAP now includes all *Mathematics* and *Statistics and Probability* unit standards from levels 1-4.

Subfield	Domain	Id
Mathematics	Algebra	11102, 12344
	Mathematical Studies	12318-12327
	Trigonometry	11103
Statistics and Probability	Statistics	11118, 12332, 12333, 12334

Unit standards from levels 5-6 are covered by AMAP 0153.