UNIT INFORMATION

UNIT CODE	CR161
UNIT NAME	Introduction to Mathematics and Numeracy
ASSOCIATED HIGHER EDUCATION AWARDS	Bachelor of Education (Primary)
DURATION	One Semester
LEVEL	Level 7
UNIT COORDINATOR	Fynn Stark
TEACHING STAFF	Fynn Stark
CORE / ELECTIVE	Core
WEIGHTING	Unit credit points 10 (0.125 EFTSL) Course credit points: 320 - Bachelor of Education (Primary)

LEARNING DELIVERY

Internal/On Campus

- Weekly lecture
- Weekly tutorial (where applicable)

Plus, Learning Portal

External/Online

- Weekly virtual lecture/ tutorial

Plus, Learning Portal

Learning Portal (Moodle™)

- Power Point presentation and resources
- Weekly readings
- Study guides
- Collaborative forums: Student forums and News forum.
- Turnitin assessment and feedback tool

All unit outlines are reviewed prior to the offering of the unit to take account of student and lecturer feedback.

STUDENT WORKLOAD

Contact hours/Directed Online study	30 hours
Reading, study and preparation	50 hours
Assignment preparation	70 hours
Total	**150 hours**

Students requiring additional English language support are expected to undertake an additional one hour per week.

PREREQUISITES / COREQUISITES / RESTRICTIONS

CR111 Introduction to Cross-Curricular Literacies (Numeracy Module)

RATIONALE

Enduring Understanding:

Mathematics is a tool to solve problems in the created universe in ways that are of immense use to humankind.

This is the first of two core units for pre-service teachers in mathematics. It introduces pre-service teachers to the discipline content of the Australian Curriculum: Mathematics within the content strands of number and algebra, measurement and geometry, and statistics and probability. The unit equips pre-service teachers to assist school students to develop numeracy and a broad and coherent understanding of mathematics, including numeration.

There is widespread agreement that exploration of numeracy is a current priority for education, and that teachers need to have well-developed personal numeracy in order to expertly teach school students. This unit will equip pre-service teachers to recognise opportunities to integrate mathematics into other curriculum areas.

CONTENT

1. The relationship between mathematics and numeracy:
   1.1. Numeracy as a general capability
   1.2. Numeracy across curricular
   1.3. Mathematics & numeracy: similarities and distinctives

2. Use of ICTs with mathematical concepts and learning experiences:
   2.1. Online tools: resources, website, program and apps
   2.2. Data collection opportunities
   2.3. Embedment into units of work

3. Representations of numbers:
   3.1. Australian Curriculum P-2 & 3-6 scope and sequence
   3.2. Place values; fractions and decimals; money and financial; percentage
   3.3. Multi-sensory representations: concrete, visual, symbolic, digital and verbal
   3.4. Real-life application and problem solving (P-2 & 3-6 levels)

4. Computation methods: mental, digital, written:
   4.1. Mental skills and strategies
   4.2. Digital applications and strategies
   4.3. Calculator skill and operations
   4.4. Written skills and strategies
   4.5. Real-life application and problem solving (P-2 & 3-6 levels)

5. Algebra: Patterns and Function:
   5.1. Fractions; type and manipulation
   5.2. Patterns: grouping, simplification and expansion
   5.3. Basic functions: powers (+ - x ÷) manipulation
   5.4. Introduction to variables
   5.5. Simple equations formulation

6. Algebra: Equivalence and Equations:
   6.1. Equation construction and rearrangement principles
   6.2. Solving equations: single variable; bi-variable (by substitution)

6.3. Real-life application and problem solving (P-2 & 3-6 levels)

7. Geometry key terminology and concepts:
   7.1. Shape classification and attributes
   7.2. Angles and symmetry
   7.3. Area and Volume (2D & 3D)
   7.4. Space and location

8. Geometric reasoning:
   8.1. Transformation: translation; rotation; reflection; ratio; scale
   8.2. Line and angle relationships
   8.3. Trigonometric theorems: Pythagoras, sine, cosine, tangent
   8.4. Real-life application and problem solving (P-2 & 3-6 levels)

9. Measurement concepts and processes:
   9.1. Units: number, space and financial mathematics applications
   9.2. Metric (SI) system
   9.3. Conversion and calculation
   9.4. Real-life application and problem solving (P-2 & 3-6 levels)

10. Data collection, analysis and representation:
    10.1. Data representation: tables, graphs, cartesian planes
    10.2. Averages: mean, mode, median and range
    10.3. Probability: box plots, stem & leaf plots
    10.4. Compound probability; two/three step and bivariate
    10.5. Real-life application and problem solving (P-2 & 3-6 levels)

LEARNING OUTCOMES

On completion of this unit, pre-service teachers will have provided evidence that they have:

1. developed knowledge and understanding across all conceptual areas relevant to Mathematics in the compulsory years of education
   Graduate Teacher Standards: 2.1, 2.5
   Graduate Attributes: 1, 4

2. understood the nature of mathematical concepts, including the ability to conceptualise the abstract nature of mathematical objects and visualise the mathematics represented by mathematical symbols
   Graduate Teacher Standards: 2.1, 2.5
   Graduate Attributes: 1, 4

3. identified key components of numeracy, incorporating the ability to use and explain a wide range of mathematical skills, methods, structures and tools flexibly in practical applications; covering number facts, computation, algebra, probability, measurement and problem-solving
   Graduate Teacher Standards: 2.1, 2.5
   Graduate Attributes: 1, 4

4. explored and critiqued mathematics learning experiences which encourage deep learning
   Graduate Teacher Standards: 2.1, 2.3
   Graduate Attributes: 4, 7

5. engaged with and critiqued the use of digital technologies in mathematics learning experiences
   Graduate Teacher Standards: 2.1, 2.6
   Graduate Attributes: 2, 4, 7

6. communicated at an appropriate tertiary standard, with special attention to design elements, grammar usage, logical relations, style, referencing and presentation
   Graduate Attributes: 6

ASSESSMENT TASKS

In order to receive a passing grade a student must fulfil the following requirements:

- adequate submission/attempt of all assessment tasks
- achieve a summative exit grade of Pass or above

TASK 1: QUIZZES

In-class/online quizzes (4) examining the studied topics for understanding and mathematical application.

Word Length/Duration: 20-30 min/quiz
Weighting: 20%
Assessed: 2, 4, 7, 9

TASK 2: INVESTIGATION

Mathematical investigation of digital tools and resources that develop personal mathematics and numeracy

Word Length/Duration: 1500 words
Weighting: 40%
Assessed: 9

TASK 3: EXAMINATION

Covering discipline content knowledge and problem solving for all content components of the Mathematics curriculum: Number and Algebra, Measurement and Geometry, Statistics and Probability.

Word Length/Duration: 2 hours
Weighting: 40%
Assessed: 17

ASSESSMENT ALIGNMENT

Assessment Task	Learning Outcome	Content	Graduate Teacher Standards	Graduate Attributes
Task 1	1-4	1-11	2.1, 2.5	1, 4, 7
Task 2	1-6	1-11	2.1, 2.5, 2.6	1, 4, 6, 7
Task 3	1-6	1-11	2.1, 2.5	1, 4. 6, 7

ASSESSMENT ELABORATION

Task 2: Investigation

Mathematical investigation of digital tools and resources that develop personal mathematics and numeracy.

Overview:
Your task is to tutor a primary or middle school student in Mathematics. You will conduct four tutoring sessions. Each session will be 45-60 minutes in duration, as appropriate to the student's needs.

As part of your range of tutoring resources, you will investigate and evaluate suitable digital tools and resources that develop personal mathematics and numeracy. You will report on your experience, reflecting on aspects of teaching, numeracy and Mathematics.

Locating a suitable candidate student is your responsibility. Exchange contact details with the parents so that clear communication is possible if problems arise. You must obtain parental permission before you begin tutoring the student. Attach written evidence of permission using the form from the CR161 Moodle site as an appendix to your report. Give a copy (electronic is fine) of the signed form to the parents.

If you are unable to meet this deadline, please discuss your situation with the lecturer.
Do not choose a member of your direct family (child or sibling) to tutor for this task. As well as raising questions about academic integrity, it is also more difficult for you due to the different kind of relationships you have with family members and is not authentic to your future role as a professional teacher.

Tutoring sessions:
The sessions should involve you interacting and teaching in a one-on-one context with the student. As far as possible, plan suitable activities and/or exercises appropriate to the year level, ability and needs of the student. A range of materials and resources should be accessed in preparation for these sessions.
You need to conduct four sessions (45 – 60 minutes duration), separated by sufficient time for the student to reflect and practice (and for you to reflect and plan). For most students this will mean one session a week for four weeks.

- You are not permitted to gain any financial benefit from work done as part of this activity.
- Consistent and regular sessions are generally most valuable for your student (and yourself).
- If for any reason you are unable to attend an arranged session, contact the parents before the session time (preferably at least 24 hours before, where possible). This is simple courtesy.

Keep a log of the sessions you conduct, using the form from the CR161 Moodle site. Each entry must be signed by another adult (e.g., the student's parent) who witnessed the session. Include the log as an appendix to your report.
After each session, spend some time reflecting on what happened, and how it relates to your student's mathematical skills and numeracy. Consider how you might be able to help the student improve their understanding and skills. Consider how useful the digital tools were in developing your student's mathematical ability. Always strive for deep relational understanding of the Mathematics, rather than simply following rule- based procedures (Learning outcome 4). Record your thoughts in a reflective journal, which will form the basis of your report.

Report:
Your report needs to include:

1. Reflective journal: Include a written reflection of your tutoring experience. Include an evaluation of digital tools and resources that you used (or considered using) with your student. It is highly recommended that you use a reflective model to structure your reflection (e.g. Bain's Reflective Model or Rolfe's Reflection Model (What? So what? Now what?)). Include at least seven references to theories of learning and Mathematics.
2. Reference List (not included in word count): Include appropriate academic references to learning resources, textbooks, research or other sources. (Not to give credit where credit is due constitutes academic dishonesty). Use APA referencing.
3. Appendices (not included in word count):
    - Written permission from your student's parent(s)/guardian(s)
    - Session log
    - Photos or copies of any important resources, e.g., activities in progress, posters or visual aids, manipulatives, worksheets

Assessment Criteria:

1. Understood the nature of mathematical concepts, including the ability to conceptualise the abstract nature of mathematical objects and discern the mathematics represented by mathematical symbols.
2. Identified key components of numeracy, incorporating the ability to use and explain a wide range of mathematical skills, methods, structures and tools flexibly in practical applications, covering number facts, computation, algebra, probability, measurement and problem-solving.
3. Explored and critiqued mathematics learning experiences which encourage deep learning.
4. Engaged with and critiqued the use of digital technologies in mathematics learning experiences.
5. Communicated at an appropriate tertiary standard: with special attention to design elements, grammars, usage, logical relations, style, referencing and presentation.

Task 3: Examination

Assessment Criteria:

1. Developed knowledge and understanding across all conceptual areas relevant to Mathematics in the compulsory years of education.
2. Understood the nature of mathematical concepts, including the ability to conceptualise the abstract nature of mathematical objects and discern the mathematics represented by mathematical symbols
3. Identified key components of numeracy, incorporating the ability to use and explain a wide range of mathematical skills, methods, structures and tools flexibly in practical applications; covering number facts, computation, algebra, probability, measurement and problem-solving.
4. Communicated at an appropriate tertiary standard: with special attention to design elements, grammars, usage, logical relations, style, referencing and presentation.

SPECIALIST FACILITIES OR EQUIPMENT

Scientific Calculator

PRESCRIBED TEXTS

Nil

Selected readings will be available via the Moodle™ site for this unit.

RECOMMENDED READINGS

CURRICULUM READINGS

Attard, C. (2013). *Engaging maths: Higher order thinking with thinkers keys.* Alexandria, NSW: SOS Media.

Booker, G., Bond, D., & Seah, R. (2021). *Teaching primary mathematics* (6th ed.). Frenchs Forest, NSW: Pearson Education Australia.

Caldwell, S. (2012). *Statistics Unplugged* (4th ed.). Belmont, CA: Wadsworth Cengage Learning.

Clausen-May, T. (2013). *Teaching mathematics visually & actively* (2nd ed.). London, UK: SAGE Publications.

Haylock, D., & Manning, R. (2019). *Mathematics explained for primary teachers* (6th ed.). London, U.K.: SAGE Publications Ltd.

MacDonald, A., & Rafferty, J. (2015). *Investigating mathematics, science and technology in early childhood.* South Melbourne, VIC: Oxford University Press.

Moomaw, S. (2013). *Teaching STEM in the early years: Activities for integrating science, technology, engineering, and mathematics.* St. Paul, MN: Redleaf Press.

O'Brien, H., & Purcell, G. (2013). *Primary maths handbook* (4th ed.). South Melbourne, VIC: Oxford University Press.

Rosen, K. (2019). *Discrete mathematics and its applications* (8th ed.). New York, NY: McGraw Hill.

Siemon, D., Warren, E., Beswick, K., Faragher, R., Miller, J., Horne, M., Jazby, D., Breed, M., Clark, J., & Brady, K. (2021). *Teaching mathematics: Foundation to middle years* (3rd ed.). South Docklands, VIC: Oxford University Press

JOURNALS

The Arithmetic Teacher
Mathematics Teacher
School Science and Mathematics
Teaching Children Mathematics

WEBSITES

Australian Curriculum, Assessment and Reporting Authority, (2016):
http://www.australiancurriculum.edu.au/mathematics/curriculum/f-10?layout=1

Australian Curriculum Lessons. (2015):
http://www.australiancurriculumlessons.com.au/category/mathematics-lessons/

Queensland Association of Mathematics Teachers:
http://www.qamt.org/

The State of Queensland, Queensland Curriculum and Assessment Authority, (2016):
https://www.qcaa.qld.edu.au/

OTHER

In addition to the resources above, students should have access to a Bible, preferably a modern translation such as The Holy Bible: The New International Version 2011 (NIV 2011) or The Holy Bible: New King James Version (NKJV).

These and other translations may be accessed free on-line at http://www.biblegateway.com. The Bible app from LifeChurch.tv is also available free for smart phones and tablet devices.

UNIT REVIEW

SEMESTER	FEEDBACK AND RESPONSE

RUBRIC

TASK 1: QUIZZES

	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
1. Developed knowledge and understanding across all conceptual areas relevant to Mathematics in the compulsory years of education. *This criterion is marked with reference to the student's responses to specific questions for each strand*					
1N Knowledge: Number	Excellent understanding of content in the Number sub-strands	Very good understanding of content in the Number sub-strands	Good understanding of content in the Number sub-strands	Satisfactory understanding of basic content in the Number sub- strands	Limited or no evidence of understanding of content in the Number sub-strands
1A Knowledge: Algebra	Excellent understanding of content in the Algebra sub-strands	Very good understanding of content in the Algebra sub-strands	Good understanding of content in the Algebra sub-strands	Satisfactory understanding of basic content in the Algebra sub- strands	Limited or no evidence of understanding of content in the Algebra sub-strands
1M Knowledge: Measurement	Excellent understanding of content in the Measurement sub- strands	Very good understanding of content in the Measurement sub- strands	Good understanding of content in the Measurement sub-strands	Satisfactory understanding of basic content in the Measurement sub-strands	Limited or no evidence of understanding of content in the Measurement sub-strands
1G Knowledge: Geometry	Excellent understanding of content in the Geometry sub-strands	Very good understanding of content in the Geometry sub-strands	Good understanding of content in the Geometry sub-strands	Satisfactory understanding of basic content in the Geometry sub-strands	Limited or no evidence of understanding of content in the Geometry sub-strands
1SP Knowledge: Statistics & Probability	Excellent understanding of content in the Statistics & Probability sub-strands	Very good understanding of content in the Statistics & Probability sub-strands	Good understanding of content in the Statistics & Probability sub-strands	Satisfactory understanding of basic content in the Statistics & Probability sub-strands	Limited or no evidence of understanding of content in the Statistics & Probability sub-strands
2. Understood the nature of mathematical concepts, including the ability to conceptualize the abstract nature of mathematical objects and visualize the mathematics represented by mathematical symbols. *This criterion is marked globally across the student's responses to the exam.*					
Abstract understanding	Exemplary abstract understanding demonstrated of relevant concepts	Deep, well-connected understanding demonstrated of relevant concepts	High level of understanding demonstrated of relevant concepts	Adequate understanding demonstrated of relevant concepts	Limited understanding of concepts demonstrated.

	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
Visualisation	Fluent, appropriate and generally correct translation of concepts between different visual, verbal and symbolic representations	Generally able to translate concepts between different visual, verbal and symbolic representations when relevant	Usually able to translate concepts between different visual, verbal and symbolic representations when needed, with a few errors	Some translation of concepts between visual and symbolic representations, with some errors	Lack of, or evident difficulty with, translation of concepts between different representations
Mathematical language	Appropriate and consistently correct usage of mathematical language and notation	Mostly appropriate, generally correct usage of mathematical language and notation	Generally appropriate and correct usage of mathematical language and notation, with some minor errors	Generally appropriate use of relevant mathematical language and notation, with some errors	Significant incorrect and/or inappropriate use of mathematical language and/or notation
3. Identified key components of numeracy, incorporating the ability to use and explain a wide range of mathematical skills, methods, structures and tools flexibly in practical applications; covering number facts, computation, algebra, probability, measurement and problem-solving. *Sub-criteria **3N** and **3T** are marked globally across the student's responses to the exam.* *Sub-criteria **3S**, **3P** and **3A** are marked with reference to the student's responses to specific questions across a range of complexities and contexts.*					
3N Number facts	Consistently accurate calculation	Generally accurate calculation	Generally accurate calculation, with some errors in complex examples	Satisfactory calculation skill, with some errors	Significant and/or frequent calculation errors, or limited calculation evident
3T Tools	Appropriate and accurate use of tools including calculator	Mostly appropriate and accurate use of tools including calculator	Generally appropriate use of tools including calculator, with some errors	Some appropriate use of tools including calculator, with some errors	Limited evidence of appropriate or accurate use of tools including calculator
3S Skills	Accurate use of mathematical procedures in simple through to complex situations	Accurate use of mathematical procedures in simple situations, and some accurate use of procedures in complex situations	Accurate use of mathematical procedures in simple situations, and some use of relevant procedures in complex situations	Generally successful use of mathematical procedures in simple situations	Limited or no success with mathematical procedures in simple situations
3P Problem solving	Consistently able to apply appropriate problem solving techniques to solve simple through to complex mathematical problems	Able to apply appropriate problem solving techniques to solve simple and some complex mathematical problems	Able to apply problem solving techniques to solve most simple mathematical problems, and to make significant progress with more complex problems	Able to apply problem solving techniques to simple mathematical problems, with some success	Little or no success with mathematical problem solving
3A Applications	Skilful application of mathematical knowledge in real-life contexts	Significant successful application of mathematical knowledge in real-life contexts	Some successful application of mathematical knowledge in real-life contexts	Some successful application of mathematical knowledge in simple life-related contexts	Limited or no success with application of mathematical knowledge in life-related contexts

	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
6. Communicated at an appropriate tertiary standard: with special attention to design elements, grammars, usage, logical relations, style and presentation. *This criterion is marked globally across the student's responses to the exam.*					
Technical issues	Correct tertiary standard English grammar, punctuation, spelling and sentence structure	Generally correct tertiary standard English grammar, punctuation, spelling and sentence structure, with some minor errors	Generally correct tertiary standard English grammar, punctuation, spelling and sentence structure, with a number of errors	Generally understandable and readable English grammar, punctuation, spelling and sentence structure, with significant errors	Poor English grammar, punctuation, spelling and/or sentence structure significantly detracts from readability or clarity
Style	Appropriate vocabulary, usage, logical structure, style and presentation for the task	Generally appropriate vocabulary, usage, logical structure, style and presentation for the task, with some minor errors	Generally suitable vocabulary, usage, style and presentation for the task, with some errors or logical inconsistencies	Some suitable vocabulary, usage, style and presentation for the task, with regular or significant errors or logical inconsistencies	Errors of usage, style and/or presentation for the task

COMMENT

RUBRIC

TASK 2: INVESTIGATION

	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
2. Understood the nature of mathematical concepts, including the ability to conceptualise the abstract nature of mathematical objects and discern the mathematics represented by mathematical symbols.					
Abstract understanding	Exemplary abstract understanding and discernment demonstrated of relevant concepts	Deep, well-connected understanding and discernment demonstrated of relevant concepts	High level of understanding and discernment demonstrated of relevant concepts	Adequate understanding and discernment demonstrated of relevant concepts	Little or no understanding or discernment of concepts demonstrated
Mathematical language	Carefully chosen, purposeful, consistently correct language and notation	Well chosen, mostly appropriate, generally correct language and notation	Generally appropriate and correct language and notation	Generally appropriate use of relevant language and notation	Frequent incorrect and/or inappropriate use of language and notation
3. Identified key components of numeracy, incorporating the ability to use and explain a wide range of mathematical skills, methods, structures and tools flexibly in practical applications; covering number facts, computation, algebra, probability, measurement and problem-solving.					
Explanations	Evidence of excellent ability to explain mathematical methods and structures	Evidence of high level of ability to explain mathematical methods and structures	Evidence of good level of ability to explain mathematical methods and structures	Evidence of satisfactory ability to explain mathematical methods and structures	Limited evidence of ability to explain mathematical methods and structures
Tools	Appropriate selection and use of mathematical tools	Mostly appropriate selection and use of mathematical tools	Generally appropriate use of mathematical tools	Some appropriate use of mathematical tools	Limited evidence of appropriate use of mathematical tools
Flexibility	Flexible approach and fluent adaptation demonstrated in use and explanation of mathematics	Flexible approach and some ability to adapt demonstrated in use and explanation of mathematics	Fairly flexible approach demonstrated in use and explanation of mathematics	Some flexibility demonstrated in use and/or explanation of mathematics	Little or no evidence of flexibility in use or explanation of mathematics
4. Explored and critiqued mathematics learning experiences which encourage deep learning.					
Depth	Appropriate use of range of learning experiences to challenge the student to think deeply to solve problems	Good use of relevant learning experiences to challenge the student to think deeply to solve problems	Good use of some relevant learning experiences to encourage the student to think deeply to solve problems	Some use of relevant learning experiences to assist the student to think mathematically	Limited evidence of learning experiences that require the student to think deeply or mathematically

	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
5. Engaged with and critiqued the use of digital technologies in mathematics learning experiences.					
Digital technologies use	Outstanding use of digital technology to enhance and deepen student learning	Highly relevant use of digital technology to enhance and deepen student learning	Some relevant use of digital technology to enhance and deepen student learning	Some relevant use of digital technology to enhance student learning	Limited or no use of digital technology to enhance student learning.
Digital technologies critique	Use of digital technology critiqued at an outstanding level and in detail, with excellent reference to theory	Use of digital technology critiqued at a high level, with very good reference to theory	Use of digital technology discussed and critiqued mostly at high level, with good reference to theory	Use of digital technology discussed with some critique and some reference to theory	Use of digital technology discussed in a limited way or not at all, with little or no reference to theory
6. Communicated at an appropriate tertiary standard: with special attention to design elements, grammars, usage, logical relations, style, referencing and presentation.					
Technical issues	Correct tertiary standard English grammar, punctuation, spelling and sentence structure	Generally correct tertiary standard English grammar, punctuation, spelling and sentence structure, with some minor errors	Generally correct English grammar, punctuation, spelling and sentence structure, with a number of errors	Generally understandable and readable English grammar, punctuation, spelling and sentence structure, with significant errors	Poor English grammar, punctuation, spelling and/or sentence structure significantly detracts from readability or clarity
Style	Appropriate vocabulary, usage, logical structure, style and presentation for the task	Generally appropriate vocabulary, usage, logical structure, style and presentation for the task, with some minor errors	Generally suitable vocabulary, usage, style and presentation for the task, with some errors.	Satisfactory usage, style and presentation for the task, with some errors or logical inconsistencies	Significant errors of usage, style and/or presentation for the task
Referencing	Complete, appropriate referencing correct according to *CHC Style Guide*	Complete referencing correct according to *CHC Style Guide*, with some minor errors and/or omissions	Referencing mostly correct according to *CHC Style Guide*; a number of errors and/or omissions	Referencing barely adequate and/or roughly following *CHC Style Guide*	Little or no referencing

COMMENT

RUBRIC

TASK 3: EXAMINATION

	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
1. Developed knowledge and understanding across all conceptual areas relevant to Mathematics in the compulsory years of education. *This criterion is marked with reference to the student's responses to specific questions for each strand*					
1N Knowledge: Number	Excellent understanding of content in the Number sub-strands	Very good understanding of content in the Number sub-strands	Good understanding of content in the Number sub-strands	Satisfactory understanding of basic content in the Number sub- strands	Limited or no evidence of understanding of content in the Number sub-strands
1A Knowledge: Algebra	Excellent understanding of content in the Algebra sub-strands	Very good understanding of content in the Algebra sub-strands	Good understanding of content in the Algebra sub-strands	Satisfactory understanding of basic content in the Algebra sub- strands	Limited or no evidence of understanding of content in the Algebra sub-strands
1M Knowledge: Measurement	Excellent understanding of content in the Measurement sub- strands	Very good understanding of content in the Measurement sub- strands	Good understanding of content in the Measurement sub-strands	Satisfactory understanding of basic content in the Measurement sub-strands	Limited or no evidence of understanding of content in the Measurement sub-strands
1G Knowledge: Geometry	Excellent understanding of content in the Geometry sub-strands	Very good understanding of content in the Geometry sub-strands	Good understanding of content in the Geometry sub-strands	Satisfactory understanding of basic content in the Geometry sub-strands	Limited or no evidence of understanding of content in the Geometry sub-strands
1SP Knowledge: Statistics & Probability	Excellent understanding of content in the Statistics & Probability sub-strands	Very good understanding of content in the Statistics & Probability sub-strands	Good understanding of content in the Statistics & Probability sub-strands	Satisfactory understanding of basic content in the Statistics & Probability sub-strands	Limited or no evidence of understanding of content in the Statistics & Probability sub-strands
2. Understood the nature of mathematical concepts, including the ability to conceptualize the abstract nature of mathematical objects and visualize the mathematics represented by mathematical symbols. *This criterion is marked globally across the student's responses to the exam.*					
Abstract understanding	Exemplary abstract understanding demonstrated of relevant concepts	Deep, well-connected understanding demonstrated of relevant concepts	High level of understanding demonstrated of relevant concepts	Adequate understanding demonstrated of relevant concepts	Limited understanding of concepts demonstrated.

	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
Visualisation	Fluent, appropriate and generally correct translation of concepts between different visual, verbal and symbolic representations	Generally able to translate concepts between different visual, verbal and symbolic representations when relevant	Usually able to translate concepts between different visual, verbal and symbolic representations when needed, with a few errors	Some translation of concepts between visual and symbolic representations, with some errors	Lack of, or evident difficulty with, translation of concepts between different representations
Mathematical language	Appropriate and consistently correct usage of mathematical language and notation	Mostly appropriate, generally correct usage of mathematical language and notation	Generally appropriate and correct usage of mathematical language and notation, with some minor errors	Generally appropriate use of relevant mathematical language and notation, with some errors	Significant incorrect and/or inappropriate use of mathematical language and/or notation
3. Identified key components of numeracy, incorporating the ability to use and explain a wide range of mathematical skills, methods, structures and tools flexibly in practical applications; covering number facts, computation, algebra, probability, measurement and problem-solving. *Sub-criteria **3N** and **3T** are marked globally across the student's responses to the exam.* *Sub-criteria **3S**, **3P** and **3A** are marked with reference to the student's responses to specific questions across a range of complexities and contexts.*					
3N Number facts	Consistently accurate calculation	Generally accurate calculation	Generally accurate calculation, with some errors in complex examples	Satisfactory calculation skill, with some errors	Significant and/or frequent calculation errors, or limited calculation evident
3T Tools	Appropriate and accurate use of tools including calculator	Mostly appropriate and accurate use of tools including calculator	Generally appropriate use of tools including calculator, with some errors	Some appropriate use of tools including calculator, with some errors	Limited evidence of appropriate or accurate use of tools including calculator
3S Skills	Accurate use of mathematical procedures in simple through to complex situations	Accurate use of mathematical procedures in simple situations, and some accurate use of procedures in complex situations	Accurate use of mathematical procedures in simple situations, and some use of relevant procedures in complex situations	Generally successful use of mathematical procedures in simple situations	Limited or no success with mathematical procedures in simple situations
3P Problem solving	Consistently able to apply appropriate problem solving techniques to solve simple through to complex mathematical problems	Able to apply appropriate problem solving techniques to solve simple and some complex mathematical problems	Able to apply problem solving techniques to solve most simple mathematical problems, and to make significant progress with more complex problems	Able to apply problem solving techniques to simple mathematical problems, with some success	Little or no success with mathematical problem solving
3A Applications	Skilful application of mathematical knowledge in real-life contexts	Significant successful application of mathematical knowledge in real-life contexts	Some successful application of mathematical knowledge in real-life contexts	Some successful application of mathematical knowledge in simple life-related contexts	Limited or no success with application of mathematical knowledge in life-related contexts

	HIGH DISTINCTION	DISTINCTION	CREDIT	PASS	FAIL
6. Communicated at an appropriate tertiary standard: with special attention to design elements, grammars, usage, logical relations, style and presentation. *This criterion is marked globally across the student's responses to the exam.*					
Technical issues	Correct tertiary standard English grammar, punctuation, spelling and sentence structure	Generally correct tertiary standard English grammar, punctuation, spelling and sentence structure, with some minor errors	Generally correct tertiary standard English grammar, punctuation, spelling and sentence structure, with a number of errors	Generally understandable and readable English grammar, punctuation, spelling and sentence structure, with significant errors	Poor English grammar, punctuation, spelling and/or sentence structure significantly detracts from readability or clarity
Style	Appropriate vocabulary, usage, logical structure, style and presentation for the task	Generally appropriate vocabulary, usage, logical structure, style and presentation for the task, with some minor errors	Generally suitable vocabulary, usage, style and presentation for the task, with some errors or logical inconsistencies	Some suitable vocabulary, usage, style and presentation for the task, with regular or significant errors or logical inconsistencies	Errors of usage, style and/or presentation for the task

COMMENT