MATHEMATICS SPECIALISED (MTS415118)

External Assessment Specifications inform the development of external assessments. The primary audience for this document is the course Setting Examiner and Exam Critics. It may also be of use to teachers and students.

These specifications must be read in conjunction with the current Course Document on the TASC website.

The external assessment for this course consists of a written exam.

WRITTEN EXAM STRUCTURE

The written exam is THREE hours.

Students will have an additional 15-minute preparation time during which students can take notes on the note paper provided and highlight any key words in the exam booklet during the allocated time. Students will not be permitted to start their exam until advised by the Exam Supervisor.

The written exam includes FIVE sections, each with five to seven questions.

The sections are in a single question booklet and can be answered in any order and at any time during the exam time

Responses to the questions are to be given in five (5) separate (lined) response booklets

The criteria to be externally assessed are:

Criterion 4: solve problems and use techniques involving finite and infinite sequences and series

Criterion 5: solve problems and use techniques involving matrices and linear algebra

Criterion 6: use differential calculus and apply integral calculus to areas and volumes

Criterion 7: use techniques of integration and solve differential equations

Criterion 8: solve problems and use techniques involving complex numbers.

SPECIFIC MATERIALS AND EQUIPMENT APPROVED FOR USE BY STUDENTS

- Current TASC MTS415118 Mathematics Specialised Information Sheet
- TASC approved calculators

Unless otherwise specified in a question, calculators are allowed to be used in all sections.

OFFICE OF TASMANIAN ASSESSMENT, STANDARDS & CERTIFICATION

ASSESSMENT

All criteria are assessed numerically with marks out of 36.

- A representative sample, encompassing a large proportion of the targeted course content areas, that tests the standard of skills, knowledge and understanding of a student.
- The relative weighting of items is indicated by
  - The relative allocation of marks, and
  - Items of questions (for example 1a, 1b or 1ai, 1aii) must have an individual mark allocation
  - For questions or items worth:
    - One (1) – no working are required for a correct answer
      - Correct answer with or without working = 1 mark
      - Incorrect answer with some incorrect working = 0.5 mark
    - Two (2) – learners are required to show relevant working
      - Correct answer with relevant working = full marks
      - Correct answer with no working = maximum 1.5 marks
      - Correct answer with some incorrect working = partial marks
      - Incorrect answer with some correct working = partial marks
      - Incorrect answer with incorrect working = no marks
    - Three (3) or more – learners are required to show relevant working
      - Correct answer with relevant working = full marks
      - Correct answer with no working = maximum half marks
      - Correct answer with some incorrect working = partial marks
      - Incorrect answer with some correct working = partial marks
      - Incorrect answer with incorrect working = no marks
- Approximately one mark per minute with 180 marks in total (not more items – just more opportunity to demonstrate knowledge and understanding of relevant criteria)

A set of solutions or a marking tool will be developed by the Setting Examiner, provided to markers at the marking meeting that follows the external written exam and will be available from TASC in the following year.

The external assessment must include items that, separately or together, give opportunities to demonstrate the standards from rating C to rating A.

Final results will be awarded as a rating of A, B, C, t or z in the above criteria. These ratings are used in determining the final award according to the algorithm in the course document.

Numerical Mark Allocation

Exam papers are designed so that the number of marks allocated to a section, part or question corresponds to the recommended time allocation for it. This is so that a student knows when answering a 10 mark question that the question has been designed for students to spend approximately 10 minutes reading, thinking and then answering the question. Students may find that they spend less or more time on certain questions throughout the exam.

SECTION A

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between five and seven questions. All questions are compulsory.
- Questions may be broken into items, which will each have their own mark allocation.

This section addresses course content from Unit 1.

Assessed Criteria

- Criterion 4 solve problems and use techniques involving finite and infinite sequences and series (all Elements).

Nature of Questions

See Appendix A

Nature of Responses

- Extended items include a balance of routine and non-routine contexts. While an individual section may focus on a specific criterion, it is reasonable to assume the student will need to draw on knowledge from across the course.
- All closed-end responses.
- Responses will be assessed numerically.

SECTION B

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between five and seven questions. All questions are compulsory.
- Questions may be broken into items, which will each have their own mark allocation.

This section addresses course content from Unit 3.

Assessed Criteria

- Criterion 5 solve problems and use techniques involving matrices and linear algebra (all Elements).

Nature of Questions

See Appendix A

Nature of Responses

- Extended items include a balance of routine and non-routine contexts. While an individual section may focus on a specific criterion, it is reasonable to assume the student will need to draw on knowledge from across the course. All closed-end responses.
- Responses will be assessed numerically.

SECTION C

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between five and seven questions. All questions are compulsory.
- Questions may be broken into items, which will each have their own mark allocation.

This section addresses course content from Unit 4a.

Assessed Criteria

- Criterion 6 use differential calculus and apply integral calculus to areas and volumes (all Elements).

Nature of Questions

See Appendix A

Nature of Responses

- Extended items include a balance of routine and non-routine contexts. While an individual section may focus on a specific criterion, it is reasonable to assume the student will need to draw on knowledge from across the course. All closed-end responses.
- Responses will be assessed numerically.

SECTION D

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between five and seven questions. All questions are compulsory.
- Questions may be broken into items, which will each have their own mark allocation.

This section addresses course content from Unit 4b.

Assessed Criteria

- Criterion 7 use techniques of integration and solve differential equations (all Elements).

Nature of Questions

See Appendix A

Nature of Responses

- Extended items include a balance of routine and non-routine contexts. While an individual section may focus on a specific criterion, it is reasonable to assume the student will need to draw on knowledge from across the course. All closed-end responses.
- Responses will be assessed numerically.

SECTION E

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between five and seven questions. All questions are compulsory.
- Questions may be broken into items, which will each have their own mark allocation.

This section addresses the course content from Unit 2.

Assessed Criteria

- Criterion 8 solve problems and use techniques involving complex numbers (all Elements).

Nature of Questions

See Appendix A

Nature of Responses

- Extended items include a balance of routine and non-routine contexts. While an individual section may focus on a specific criterion, it is reasonable to assume the student will need to draw on knowledge from across the course. All closed-end responses.
- Responses will be assessed numerically.

Appendix A

TYPES of Questions (All SECTIONS)

A balance of items ranging from short to extended formats in each section (no item will have more than 9 marks allocated).

Short response format

These items are composed of a brief prompt that demands a response to some stimulus material that varies from a single response to a few written points. This sort of item is suited to assessing the candidate's ability:

- to recall specific information and methods related to key content
- to apply rehearsed methods to familiar situations
- to demonstrate understanding of key concepts in unseen stimulus material.

Exemplar:

(3 marks)

$\boldsymbol{A}=\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $\boldsymbol{B}=\begin{pmatrix} -1 & 0 \\ 0 & 2 \end{pmatrix}$ Find $\boldsymbol{A}$ given that $\boldsymbol{AB}=\boldsymbol{A}+2\boldsymbol{B}$.

Medium length response format

These items may vary between a mixture of a number of shorter responses to a multiple stage response of increasing complexity. Greater complexity may be due to one or more of the following:

- A greater cognitive demand of mathematical concepts
- The necessity to select appropriate data, information and/or formulae
- Justification of a response via a logical line of reasoning.

Exemplar:

(5 marks)

Prove that the sequence $\left\{\dfrac{n^3-n^2+n-1}{n^3-1}\right\}$ converges to 1.

Extended response format

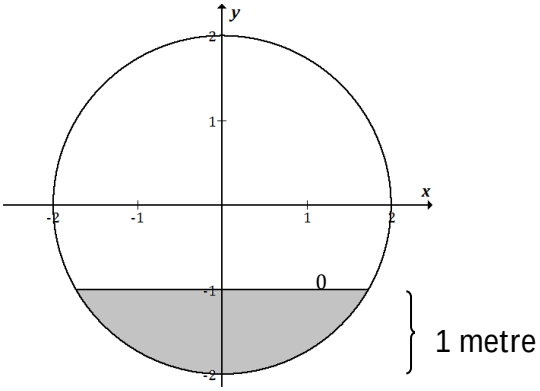
These items involve multi-stage responses of increasing complexity. Greater complexity may be due to one or more of the following:

- A greater cognitive demand of mathematical concepts
- The necessity to select appropriate data, information and/or formulae
- The necessity to select from (and possibly adapt) a number of procedures met in the course
- Justification of a response via a logical line of reasoning.

Exemplar:

(7 marks)

A spherical container of radius 2 metres is partly filled with water, as shown below. The depth of the water in the container is 1 metre.



A cross-section of the container is represented by the graph with equation $x^2 + y^2 = 4$. Calculate the exact volume of water in the container algebraically and hence show that the proportion of water in the container is $\frac{5}{32}$ of the volume of the container.