MATHEMATICS METHODS 4
COURSE CODE: MTM415117

The purpose of the External Assessment Specifications is to provide information about the external assessment.

The criteria to be externally assessed are: 4, 5, 6, 7 and 8

The format of the external assessment is: a 3-hour written examination.

Approved assessment specific materials and equipment:
A calculator approved by TASC
External examination Information Sheet for Mathematics Methods

WRITTEN EXAMINATION CONTENT

- A representative sample, encompassing a large proportion of the targeted course content areas, tests the standard of skills, knowledge and understanding of a candidate

- The relative weighting of items is indicated by
  - The relative allocation of marks, and
  - Space for responses
  - Sub questions (for example 1a, 1b or 1ai, 1aii) must have an individual mark allocation
  - For items or sub items worth:
    - One (1) mark items, no workings are required for a correct answer
      - Correct answer with or without working = 1 mark
Correct answer with some incorrect working = 1 mark
Incorrect answer with some correct working = 0.5 mark

Two (2) mark items, 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 mark items, 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 a mark per minute with 80 marks in Part 1 and 100 marks in Part 2 (not more items – just more opportunity to demonstrate knowledge and understanding of relevant criteria).

WRITTEN EXAMINATION STRUCTURE

The examination paper is divided into two parts, each with five (5) sections:

- Part 1 and Part 2 are of unequal weighting as indicated by time and mark allocations
- The parts are in two separate item-and-response booklets
- Part 1 is collected 80 minutes after examination commencement, from which time calculators may be used. (Part 2 can be commenced at any stage without calculator usage in the 80 minute period.)
The following specifications for each part are outlined in the table on the following pages:

- The distribution across the parts of:
  - Criteria
  - Course content (topics)
  - Time and mark allocations
- Number and type of items.

<table>
<thead>
<tr>
<th>Part</th>
<th>Part 1</th>
<th>Part 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculators</td>
<td>Calculators are NOT allowed to be used. 5 sections</td>
<td>Calculators are allowed to be used. 5 sections</td>
</tr>
<tr>
<td>Criteria</td>
<td>Criteria 4, 5, 6, 7 includes all elements</td>
<td>Criteria 4, 5, 6, 7 and 8 includes all elements</td>
</tr>
<tr>
<td>Elements</td>
<td>Criterion 8 includes all elements except elements 3, 5, 6 where it specifies the use of technology</td>
<td></td>
</tr>
<tr>
<td>Topics</td>
<td>Functions and graphs</td>
<td>Functions and graphs</td>
</tr>
<tr>
<td></td>
<td>Circular (trigonometric) functions</td>
<td>Circular (trigonometric) functions</td>
</tr>
<tr>
<td></td>
<td>Differential calculus</td>
<td>Differential calculus</td>
</tr>
<tr>
<td></td>
<td>Integral calculus</td>
<td>Integral calculus</td>
</tr>
<tr>
<td></td>
<td>Statistics and probability</td>
<td>Statistics and probability</td>
</tr>
<tr>
<td></td>
<td>One topic per section which are equally weighted.</td>
<td>One topic per section which are equally weighted.</td>
</tr>
<tr>
<td>Number of items</td>
<td>From 3 to 6 per section, with a total allocation of 16 marks per section. (Each item may be broken into sub items which will each have their own mark allocation)</td>
<td>From 3 to 6 per section, with a total allocation of 20 marks per section. (Each item may be broken into sub items which will each have their own mark allocation)</td>
</tr>
<tr>
<td>Number of compulsory items</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>Item type(s)</td>
<td>A balance of items ranging from short to extended formats (no item or sub item will have more than 10 marks allocated)</td>
<td>A balance of items ranging from short to extended formats (no item or sub item will have more than 10 marks allocated)</td>
</tr>
</tbody>
</table>
Extended items include a balance of routine and non-routine contexts. All closed-ended responses.

<table>
<thead>
<tr>
<th>Suggested Time allocation</th>
<th>80 minutes</th>
<th>100 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mark allocation</td>
<td>80 marks</td>
<td>100 marks</td>
</tr>
</tbody>
</table>

A set of solutions will be provided to markers at the marking meeting and made publically available and published with the assessment report early in the following year.
EXTERNALLY ASSESSED CRITERIA

The following criteria and their standards are assessed as follows.

- **Criterion 4:** understand polynomial, hyperbolic, exponential and logarithmic functions
  
  All aspects of Criterion 4 standards are examinable

- **Criterion 5:** understand circular functions
  
  All aspects of Criterion 5 standards are examinable

- **Criterion 6:** use differential calculus in the study of functions
  
  All aspects of Criterion 6 standards are examinable

- **Criterion 7:** use integral calculus in the study of functions
  
  All aspects of Criterion 7 standards are examinable

- **Criterion 8:** understand binomial and normal probability distributions and statistical inference
  
  All aspects of Criterion 8 standards are examinable, with the technology required aspects of elements 3, 5 and 6 examinable only in Part 2 of the examination.

**Noting that:**

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.
ATTACHMENT 1

Item types

*The form in which candidates must answer*

- **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.

<table>
<thead>
<tr>
<th>Exemplar:</th>
<th>Differentiate $\frac{x^4}{\cos x}$</th>
<th>(2 marks)</th>
</tr>
</thead>
</table>

- **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 and/or formulae
  - Justification of a response via a logical line of reasoning.

| Exemplar: | A ladder, $L$, is required to just clear a 3 metre fence and lean up against a large wall, $W$, which is positioned 2 metres behind the fence. The base of the ladder is $x$ metres from the wall. The diagram below represents the above information. | |
(a) In similar triangles, the ratio of corresponding sides are equal, hence
\[
\frac{AC}{ED} = \frac{AB}{EB}.
\]  
(1 mark)

Use this relationship to determine an expression for \( W \) in terms of \( x \).

(b) Hence, show that an expression for the length, \( L \), of the ladder in terms of \( x \) is represented by the equation
\[
L = \sqrt{x^2 + \frac{9x^2}{(x - 2)^2}}.
\]  
(2 marks)

(c) Using a gradient table, or some other means, provide reasoning that justifies the existence of a local minimum for \( L \), at \( x = \text{4.62 m} \).  
(2 marks)

*Note: You do not need to provide an expression for \( L'(x) \).*

(d) Hence, determine the minimum length of the ladder required. \( \quad \)  
(1 mark)

*Express your answer in metres correct to 1 decimal place.*
## ATTACHMENT 2
### WRITTEN EXAMINATION CHECKLIST

#### PART I

#### SECTION A
- ☐ assesses examinable aspects of Criterion 4
  - ☐ provides a list of all content points that have been included
  - ☐ provides opportunities to demonstrate standards from rating C to rating A
  - ☐ provides a list of all elements from C to A that have been included
- ☐ includes a representative sample of course content
- ☐ comprises three to six questions.
- ☐ marks clearly indicated for all questions and sub items
- ☐ no question or sub questions worth more than 10 marks.

#### SECTION B
- ☐ assesses examinable aspects of Criterion 5
  - ☐ provides a list of all content points that have been included
  - ☐ provides opportunities to demonstrate standards from rating C to rating A
  - ☐ provides a list of all elements from C to A that have been included
- ☐ includes a representative sample of course content
- ☐ comprises three to six questions.
- ☐ marks clearly indicated for all questions and sub items
- ☐ no question or sub questions worth more than 10 marks.

#### SECTION C
- ☐ assesses examinable aspects of Criterion 6
  - ☐ provides a list of all content points that have been included
  - ☐ provides opportunities to demonstrate standards from rating C to rating A
  - ☐ provides a list of all elements from C to A that have been included
- ☐ includes a representative sample of course content
- ☐ comprises three to six questions.
- ☐ marks clearly indicated for all questions and sub items
- ☐ no question or sub questions worth more than 10 marks.

#### SECTION D
- ☐ assesses examinable aspects of Criterion 7
  - ☐ provides a list of all content points that have been included
  - ☐ provides opportunities to demonstrate standards from rating C to rating A
  - ☐ provides a list of all elements from C to A that have been included
- ☐ includes a representative sample of course content
- ☐ comprises three to six questions.
- ☐ marks clearly indicated for all questions and sub items
- ☐ no question or sub questions worth more than 10 marks.

#### SECTION E
- ☐ assesses examinable aspects of Criterion 8 (excluding technology aspects of elements 3, 5, 6)
  - ☐ provides a list of all content points that have been included
  - ☐ provides opportunities to demonstrate standards from rating C to rating A
  - ☐ provides a list of all elements from C to A that have been included
- ☐ includes a representative sample of course content
- ☐ comprises three to six questions.
- ☐ marks clearly indicated for all items and sub items
- ☐ no item or sub item worth more than 10 marks.
PART 2

SECTION A
- assesses examinable aspects of Criterion 4
- provides a list of all content points that have been included
- provides opportunities to demonstrate standards from rating C to rating A
- provides a list of all elements from C to A that have been included
- includes a representative sample of course content
- comprises three to six questions.
- marks clearly indicated for all questions and sub items
- no question or sub questions worth more than 10 marks.

SECTION B
- assesses examinable aspects of Criterion 5
- provides a list of all content points that have been included
- provides opportunities to demonstrate standards from rating C to rating A
- provides a list of all elements from C to A that have been included
- includes a representative sample of course content
- comprises three to six questions.
- marks clearly indicated for all questions and sub items
- no question or sub questions worth more than 10 marks.

SECTION C
- assesses examinable aspects of Criterion 6
- provides a list of all content points that have been included
- provides opportunities to demonstrate standards from rating C to rating A
- provides a list of all elements from C to A that have been included
- includes a representative sample of course content
- comprises three to six questions.
- marks clearly indicated for all questions and sub items
- no question or sub questions worth more than 10 marks.

SECTION D
- assesses examinable aspects of Criterion 7
- provides a list of all content points that have been included
- provides opportunities to demonstrate standards from rating C to rating A
- provides a list of all elements from C to A that have been included
- includes a representative sample of course content
- comprises three to six questions.
- marks clearly indicated for all questions and sub items
- no question or sub questions worth more than 10 marks.

SECTION E
- assesses examinable aspects of Criterion 8
- provides a list of all content points that have been included
- provides opportunities to demonstrate standards from rating C to rating A
- provides a list of all elements from C to A that have been included
- includes a representative sample of course content
- comprises three to six questions.
- marks clearly indicated for all items and sub items
- no item or sub item worth more than 10 marks.