

**2026, Term 1**

**M4/18, M4/19**

**Mathematics MA31101**

Topics:

- Sets
  - Representing a Set
  - Elements of Set
  - Types of Sets
  - Operations on Sets
  - Venn Diagrams
  - Set Properties
  - Set Formulas
  - Applications of Sets
  - Cartesian Product of Sets
- Logic
  - Logical Connectives
  - Compound Statements
  - Contrapositive
  - Equivalent Statements
  - Quantifiers, and Fallacies
  - Basics of Proof Writing
  - Sets and Logic

Materials:

- M4 Maths Textbook
- Notebook
- Pens

Week 1	<p><b>Representing a Set</b></p> <p>Students will begin to get comfortable with a variety of new symbols, and what they mean.</p> <p>This introduces a more formal style of math writing to students.</p>
Week 2	<p><b>Elements of a Set</b></p> <p>Deepen students understanding of the foundations of sets while also giving more exposure to new mathematical symbols.</p> <p>This topic also discusses what is in sets and possibly what do we mean by 'well defined'.</p>
Week 3	<p><b>Types of Sets</b></p> <p>Sets can be categorized by a variety of different features. Students will learn about some these categories, and how they are defined.</p> <p>Many of the topics here are foundational notions for further units, and open the door to the student's individual imagination for what sets can be used for.</p>
Week 4	<p><b>Operations on Sets</b></p> <p>In this unit students will learn how to perform a variety of operations on sets.</p> <p>Some of these operations are as simple as finding out how a big a set is, but most are about how sets are put together, and taken apart, where they overlap, and what is outside of the set.</p>
Week 5	<p><b>Venn Diagrams</b></p> <p>Diagrams offer a very easy visual approach to understanding the more dense and formal descriptions of sets.</p> <p>With these diagrams and the notions of what is possible, students can learn how to apply set theory to practical problems.</p>
Week 6	<p><b>Set Properties</b></p> <p>The set properties use the information from the previous units to gain a perspective on foundational notions in math.</p> <p>Students may begin to understand why certain basic things work the way they do in math, and when do these most basic rules apply.</p>
Week 7	<p><b>Set Formulas</b></p> <p>Using the previous units information students will slowly build up a series of identities that simplify set operations.</p> <p>In a way this previews some of the notions in the unit about logic.</p> <p>Students take basic statements and build more complex structures.</p>
Week 8	<p><b>Applications of Sets</b></p>

	<p>This unit again explores more practical uses for sets. Hopefully students will start to think about sets as a tool box for solving specific problems.</p>
Week 9	<p><b>Cartesian Products of Sets</b>  This again is more foreshadowing for future topics. We will talk about relationships, functions, and some applications to this product.</p>
Week 10	<p><b>Midterm Exam Revision</b>  Give students an exam break down. Highlight key information, and solve specific examples to help them prepare for the test.</p>
Week 11	<p><b>Logical Statements</b>  After midterms the focus shifts to the language of mathematics. We will talk about what makes a statement in this sense, and some basic notions of true and false.</p>
Week 12	<p><b>Logical Connectives</b>  We will literally build on statements by thinking about how statements are put together to build more complex statements.</p>
Week 13	<p><b>Compound Statements</b>  We will continue to build more complex statements and explore when these statements are true, and when they are false.</p>
Week 14	<p><b>Contrapositive</b>  After some understanding of conditional statements has been reached, we might notice that <math>P \Rightarrow Q</math> has the same truth value as <math>\sim Q \Rightarrow \sim P</math>.</p>
Week 15	<p><b>Equivalent Statements</b>  If we can rearrange our statements so that the truth values are the same, we can create statements that are logically the same even though they look different.</p>
Week 16	<p><b>Quantifiers, and Fallacies</b>  Quantifiers for the end of the new symbols we expect students to have some understanding of. These tells us something about 'for every' and 'there exists'.  It is quite easy to fall into various logical traps that pin us into impossible situations. Such traps are fallacies, or more generally mistakes.</p>
Week 17	<p>Basics of Proof Writing 1</p>

	We will begin to explore basic ways to show something is true. Many of these proofs can be done directly, or by counter-example
Week 18	<b>Basics of Proof Writing 2</b> We will finish basic proof writing with more advanced methods of showing something is true. Possibly ending with logical induction.
Week 19	<b>Sets and Logic</b> We will wrap up by bridging the two topics. These two topics describe the same thing from different angles. Students may find one way of thinking easier than the other, and solving problems in their preferred method and translating the results.
Week 20	<b>Final Exam Revision</b> Give students an exam break down. Highlight key information, and solve specific examples to help them prepare for the test.

Weekly schedules are liable to change based on the actual situation in the classroom.

There are any number of holidays and activities that may disrupt the schedule.

Additionally, not every class can master the materials at the same pace. This results in some topics being either condensed or omitted.

## Basic Teaching Plan

### Objective:

Give students the opportunity to learn the main points of each lesson in accordance with the indicators, and the above schedule of topics.

### Materials:

- M4 Textbook
- Notebook
- Pens
- Overhead projector

### Procedure:

- Class always begins with attendance check
- Collect any assignments that are due, return any assignments that are scored
- Begin discussing the day's learning objective
- Teacher can highlight the key terms, and concepts
- Teacher can demonstrate key terms, concepts, and problem solving techniques
- Teacher assigns some classwork/homework
- Students have an opportunity to do the classwork in groups or individually as desired.
- Teacher will monitor the class offering support, feedback, and motivation as needed
- Time permitting, recap the main points of the lesson
- Unfinished classwork becomes homework, and a due date is given (typically at the end of the unit)

## Scoring

My understanding of the scoring system is as follows:

- 45 points are available by the end of midterm exams
  - 25 points come from coursework
  - 20 points from the midterm exam
- 55 points are available for the second half of the term ending with a final exam
  - 25 points come from coursework
  - 30 points from the final exam

This gives 50 points total to coursework broken down into;

- 10 points for attendance
- 10 points for attitude
- 10 points for a graded project
- 10 points for classwork and homework
- 10 points for quizzes

Of these 10 point allotments, 5 points are prior to midterm, 5 points after.

## Scoring Rubrics

Points assigned to exams, quizzes, are awarded based on correct answers, and reasoning.

Points assigned for graded project, classwork and homework fit on a 1 to 5 scale.

Points	Descriptor
5	All work is complete, with good presentation, few if any errors
4	Most work is complete and presented well
3	Some of the work is incomplete
2	Most of the work is incomplete, or prone to many errors
1	Work is missing, incomplete, or so sloppily done as to be illegible

Points assigned for attendance and attitude also follow a scale 1-5.

Points	Descriptor
5	Never misses class and is rarely ever distracted Student approaches coursework as if it was an enjoyable activity to do with their friends
4	Rarely misses class and usually attentive Effort is forthcoming. Student finishes assigned tasks without much if any direct supervision
3	Normally comes to class and usually attentive Effort is normal. Student may not like the subject but does enough to finish assigned tasks
2	Misses class frequently Effort in completing classwork is seriously lacking. It often takes more effort to get them working than it would be to just finish the task at hand
1	Rarely attends class Fails to put forth minimum effort needed to stay awake, or complete simple tasks