

# MATH 7009 MATHEMATICAL PROOF AND REASONING

**Credit Points** 10

**Legacy Code** 301177

**Coordinator** Stephen Weissenhofer ([https://directory.westernsydney.edu.au/search/name/Stephen Weissenhofer/](https://directory.westernsydney.edu.au/search/name/Stephen%20Weissenhofer/))

**Description** Proving and getting a new proposition by careful reasoning from given propositions, is the essence of mathematics. Proof is what makes mathematics special and eternal. This unit looks at the different methods of proof and reasoning that can be employed to verify that statements are true or not. Students will consider propositions and theorems from various areas of mathematics and look at classic, interesting and sometimes novel ways these can be proved. Successful students taking this unit will not only be able to follow and determine if a proof is correct, but become proficient at mathematical reasoning.

**School** Computer, Data & Math Sciences

**Discipline** Mathematical Sciences, Not Elsewhere Classified.

**Student Contribution Band** HECS Band 1 10cp

**Level** Postgraduate Coursework Level 7 subject

**Assumed Knowledge**

Undergraduate level of knowledge in mathematics or statistics.

## Learning Outcomes

On successful completion of this subject, students should be able to:

1. Analyse mathematical arguments and determine whether or not they are sound.
2. Make concise rational arguments to prove true statements.
3. Be able to construct counter examples to disprove false statements.
4. Recognise standard types of statements and know the type of argument that is required to prove them.
5. Correctly utilise different types of proof; for example, direct, contradiction and induction.
6. Apply proof techniques to different areas of mathematics; for example, geometry, number theory and other relevant areas.

## Subject Content

Logic, valid arguments and common invalid arguments.

The structure of mathematical proofs.

Direct proof and counter-example.

Proof by cases.

Indirect proof, contradiction and contrapositive.

Existence and Uniqueness proofs.

Mathematical Induction proofs.

## Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are regularly updated, where there is a difference your Learning Guide takes precedence.

Item	Length	Percent	Threshold	Individual/ Group Task
Assignments	3-4 hours each	30	N	Individual
Class Tests	50 minutes each	30	N	Individual
Final Exam	2 hours	40	N	Individual

Teaching Periods