# MATH 3015 GROUPS AND SYMMETRY

**Credit Points** 10

**Legacy Code** 301376

**Coordinator** Colin Reid (https://directory.westernsydney.edu.au/search/name/Colin Reid/)

**Description** This subject develops abstract algebraic thinking to a higher level. The abstract concepts introduced in the subject, the theory of groups and abstract symmetry, have many applications in science and technology. Symmetry plays a role in many different contexts: in crystals, in visual arts, in music and in architecture, to name a few. Analysing and exploiting the symmetries of a particular problem often is the first step towards finding a practical solution to the problem. Group theory is the study of symmetry. This subject develops the language of groups and techniques to understand the structure of groups.

**School** Computer, Data & Math Sciences

**Discipline** Mathematics

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

Check your fees via the Fees (https://www.westernsydney.edu.au/currentstudents/current_students/fees/) page.

**Level** Undergraduate Level 3 subject

**Pre-requisite(s)** MATH 1006

**Equivalent Subjects** MATH 3001 Abstract Algebra

**Assumed Knowledge**

Logic, proof techniques: direct proof, proof by division into cases, proof by contradiction, proof by induction.

## Learning Outcomes

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

1. Apply fundamental structures in abstract algebra: groups, subgroups, and permutation groups.
2. Apply concepts from group theory to the study of the symmetry of objects, such as polygons.
3. Formulate proofs involving groups, subgroups, and permutation groups.
4. Communicate mathematical arguments effectively in both spoken and written format.

## Subject Content

- Sets and equivalence relations
- Introduction to groups
- Examples of groups and basic properties of groups
- Finite groups and subgroups
- Cyclic groups
- Permutation groups
- Cosets and Lagrange?fs Theorem
- Normal subgroups and factor groups
- Group homomorphisms and group isomorphisms
- Cayley graphs of groups
- Applications of groups

## 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.

| Type | Length | Percent | Threshold | Individual/ Group Task | Mandatory |
|---|---|---|---|---|---|
| Quiz | 20 minutes | 10 | N | Individual | N |
| Quiz | 20 minutes | 10 | N | Individual | N |
| Numerical Problem Solving | 3-6 pages | 20 | N | Individual | Y |
| Presentatio | 15 minutes | 10 | N | Individual | Y |
| Final Exam | 2 hours | 50 | N | Individual | Y |

Teaching Periods

## Spring (2025)

### Campbelltown

#### On-site

**Subject Contact** Colin Reid (https://directory.westernsydney.edu.au/search/name/Colin Reid/)

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=MATH3015_25-SPR_CA_1#subjects)

### Penrith (Kingswood)

#### On-site

**Subject Contact** Colin Reid (https://directory.westernsydney.edu.au/search/name/Colin Reid/)

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=MATH3015_25-SPR_KW_1#subjects)

### Parramatta - Victoria Rd

#### On-site

**Subject Contact** Colin Reid (https://directory.westernsydney.edu.au/search/name/Colin Reid/)

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=MATH3015_25-SPR_PS_1#subjects)