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## MATH20201

Algebraic Structures 1

<b>Unit code:</b>	MATH20201
<b>Credit Rating:</b>	10
<b>Unit level:</b>	Level 2
<b>Teaching period(s):</b>	Semester 1
<b>Offered by</b>	School of Mathematics
<b>Available as a free choice unit?:</b>	N

### Requisites

#### Prerequisite

- [MATH10101 - Sets, Numbers and Functions A](#) (Compulsory)
- [MATH10111 - Sets, Numbers and Functions B](#) (Compulsory)

### Aims

The course unit aims to introduce basic ideas group theory with a good range of examples so that the student has some familiarity with the fundamental concepts of abstract algebra and a good grounding for further study.

### Overview

This course unit provides an introduction to groups, one of the most important algebraic structures. It gives the main definitions, some basic results and a wide range of examples. This builds on the study of topics such as properties of the integers, modular arithmetic, and permutations included in MATH10101/MATH10111. Groups are a fundamental concept in mathematics, particularly in the study of symmetry and of number theory.

## Assessment methods

- Other - 20%
- Written exam - 80%

## Assessment Further Information

- Coursework; An in-class test, weighting within unit 20%
- 2 hours end of semester examination; Weighting within unit 80%

## Learning outcomes

On completion of this unit successful students will be able to:

- Appreciate and use the basic definitions and properties of groups;
- Command a good understanding of the basic properties for a good range of examples;
- Understand and find simple proofs of results in group theory.

## Syllabus

- **Binary operations.** Multiplication tables, associativity, commutativity, associative powers. [2 lectures]
- **Groups.** Definitions and examples (groups of numbers, the integers modulo  $n$ , symmetric groups, groups of matrices). [2]
- **Subgroups.** Subgroup criterion, cyclic subgroups, centralizer, centre, order of an element. [4]
- **Cyclic groups.** Subgroups of cyclic groups are cyclic, subgroups of finite cyclic groups. [1]
- **Cosets and Lagrange's Theorem.** [2]
- **Homomorphisms and isomorphisms.** Definition and examples, group theoretic properties. [2]
- **Conjugacy.** Conjugacy classes, conjugacy in symmetric groups, the class formula. [4]
- **Normal subgroups.** [2]
- **Factor groups.** [2]
- **The First Isomorphism Theorem** [1]

## Recommended reading

John B. Fraleigh, A First Course in Abstract Algebra, Addison-Wesley

## Feedback methods

Tutorials will provide a place for student worked examples to be marked and discussed providing feedback on performance and understanding.

### **Study hours**

- Lectures - 33 hours
- Independent study hours - 67 hours

### **Teaching staff**

Ralph Stohr - Unit coordinator