

## MATH3710: A Tentative Syllabus

### Examples of Groups

Lecture 1: How do mathematicians study symmetry?

Lecture 2: Matric groups. Basic properties. Subgroups.

Lecture 3: Permutation groups.

Lecture 4: Generators. Diehdral group.

Lecture 5: Alternating group. Abelian groups. Review of equivalence relations.

### Basic Concepts and Constructions

Lecture 6: Cosets and Lagrange's theorem.

Lecture 7: Normal subgroups and quotient groups.

Lecture 8: Isomorphisms and homomorphisms.

Lecture 9: Universal property of quotient groups.

Lecture 10: First isomorphism theorem.

Lecture 11: Second and third isomorphism theorems.

Lecture 12: Products.

### Symmetry of polygons and polyhedra.

Lecture 13: Dihedral groups.

Lecture 14: Group operations, orbits and stabilisers.

Lecture 15: Operation on the space of cosets.

Lecture 16: Counting formula and permutation representations.

Lecture 17: Finite subgroups of  $SO_3$ .

Lecture 18: Finite subgroups of  $SO_3$  continued.

### Finer theory of groups.

Lecture 19: Class equation and consequences.

Lecture 20: Statement and application of Sylow theorems.

Lecture 21: Torsion and free abelian groups.

Lecture 22: Structure theorem for finitely generated abelian groups.

Lecture 23: Solvable groups.

Lecture 24: Jordan-Holder theorem.

Lecture 25: Free groups.

Lecture 26: Graphs.

Lecture 27: Fundamental Groups.

Lecture 28: Nielsen-Schreier theorem.