**Supervisor: Dr Y Bazlov**

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| 1 | Project Title | Symmetric groups and bell ringing |
| 2 | Category | Pure |
| 3 | Level  | 3 |
| 4 | Semesters (length of project) | 1 |
| 5 | Description | Change ringing is a centuries old practice of ringing a set of bells, which is very much alive today. Essentially, it involves ringing all possible permutations of a given set of bells, but subject to certain constraints dictated by practical issues such as the inertia of bells. The goal of the project is to give a mathematical account of how the structure of the symmetric group, and especially its cosets, can be used to produce methods of change ringing.  |
| 6 | References | Chapters devoted to the topic can be found in the following books:(1) The Mathematics of Juggling, by Burkhard Polster(2) The Fascination of Groups, by F.J. Budden(3) Another Fine Math You've Got Me Into, by Ian Stewart(4) Music and Mathematics: From Pythagoras to Fractals, edited by John Fauvel, Raymond Flood, and Robin WilsonIf desired, the students can also read the mystery novel *The Nine Tailors* by Dorothy L. Sayers (1934) which contains a great deal of information on change ringing. |
| 7 | Prerequisite courses | MATH20202 |  |  |
| 8 | Additional notes | Taking MATH32001 *Group Theory* before, or alongside, the project is an advantage.  |