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Worksheet for the Practical Session on Computational Representation Theory within the program *Group Theory and Computational Methods*, ICTS-TIFR, Bangalore, 05 – 14 November 2016

Aims: Learn how to use `atlasrep` and the GAP `MeatAxe`

Tasks:

1. Retrieve the group M_{11} in its permutation representation on 11 points using `atlasrep`. Read "2.1 Accessing a Specific Group in AtlasRep" first.
2. Construct the corresponding permutation module `m1` for M_{11} over the field GF(3). Is `m1` irreducible?
3. Construct the module `m1m1` := `m1` $\otimes$ `m1`.
4. Find all the composition factors of `m1m1`. How many do you find? What are their degrees? Which of these are isomorphic?
5. Continue until you have found all the irreducible representation of M_{11} over GF(3) (up to isomorphism).
6. How many irreducible representations do you expect?
7. Construct all irreducible representation of M_{11} over GF(q) (up to isomorphism) for $p = 2, 4, 5, 25, 11$ along the same lines.

Tutorial for `atlasrep`:

`http://www.math.rwth-aachen.de/~Thomas.Breuer/atlasrep/doc/chap0.html`

Manual for the `MeatAxe`: Chapter 69 of the GAP Reference Manual

`http://www.gap-system.org/Manuals/doc/ref/chap0.html`