

Sheet V

Return by 24.10.2013

Question 1 [*Irreducible representations of S_4 from Young diagrams*]: On Sheets III and IV you computed the irreducible representations of S_4 and decomposed them into the irreducible representations of S_3 . We will now see how this analysis can be made more systematic using the Young diagram formalism.

- (i) For the case of S_4 find all 5 Young diagrams.
- (ii) For each diagram, choose a standard filling, thus defining a standard Young tableau.
- (iii) For each of these Young tableaux, determine the Young symmetriser.
- (iv) Determine the resulting irreducible representation, i.e., find the matrix representation of the generators of S_4 , and compare your result to what was obtained on Sheet III, Question 3 before.
- (v) Check that the branching rules for the decomposition of these representations under the subgroup $S_3 \subset S_4$ (see Sheet IV, Question 1) correspond precisely to the different ways in which one can remove a box of the relevant Young diagram with 4 boxes to obtain a Young diagram with 3 boxes.