QUEEN MARY, UNIVERSITY OF LONDON

MAS 305   **Algebraic Structures II**

Assignment 5   **For handing in on 15 November 2006**

Write your name and student number at the top of your assignment before handing it in. Staple all the pages together. Give the completed assignment to me in person in the Wednesday lecture.

This week's reading: Cameron, Sections 7.1.2–7.1.5 *or* Ledermann and Weir, Chapter 7 and Sections 4.3, 10.2 and 10.3.

1 Show that there is no simple group of order 30.

2 Find 10 groups G with $25 \leq |G| \leq 29$, and explain why each pair of the same order are not isomorphic to each other.

3 Let p be a prime number. Consider the symmetric group S_p.

   (a) Show that the Sylow p-subgroups of S_p are cyclic.

   (b) How many Sylow p-subgroups does S_p have?

   (c) Let Q be a Sylow p-subgroup of S_p. Find $|N(Q)|$.

4 Give a composition series for (a) C_{20}, (b) D_{20}, (c) S_{20}.