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# HW 8 , Math 530, Fall 2014

Ayman Badawi

**QUESTION 1.** (i) Show that the groups $A_5$ and $S_5$ each have 10 subgroups of size 3 and 6 subgroups of size 5.[Hint: Note that $A_n$ is a simple group for every $n \geq 5$. Also ask yourself this question: If $\alpha \in S_n$ and of odd prime order, where does $\alpha$ "live"? ]

(ii) Show that every group of order 45 is abelian.

(iii) Let $G$ be a group of order 12. Show that $G$ must have a normal 2-Sylow subgroup (i.e., of order 4)or 3-Sylow subgroup.

(iv) Let $G$ be a group of order 70. Show that $G$ has a normal subgroup of order 35. Show that all elements of order 2 in $G$ are conjugate to each other.

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