

Instructions. Write all answers clearly on one piece of paper, and put all group members' names on the top of the paper. If you talk, you must do so **very quietly!**

1. When do we say that a group is *cyclic*?
2. What is the criterion for $a^i = a^j$ when a is an element of a group G with order $|a| = n$, and $i, j \in \mathbb{Z}$?
3. For how many elements $a \in \mathbb{Z}_{15}$ does $\langle a \rangle = a \in \mathbb{Z}_{15}$? (\mathbb{Z}_{15} is integers mod 15 under addition.)
4. Let G be a group and a an element of G with $|a| = n \in \mathbb{Z}^+$. Generally speaking, what does the Fundamental Theorem of Cyclic Groups say about the subgroups of $\langle a \rangle$, when the order of a is a positive integer?