Prove the following theorems

**Theorem 1.** Suppose $G, \ast$ is abelian. Then every subgroup, $H$ of $G$ is normal.

**Theorem 2.** If $G, \ast$ is a group and $H \triangleleft G$, then the set of cosets, $G/H$ is a group with the binary operation defined by $(xH) \bullet (yH) = (x \ast y)H$.

(If you get stuck, have a look at page 174)

**Theorem 3.** If $G, \ast$ is an abelian group and $H < G$, then $G/H$ is an abelian group.

• Write out Theorem 2.4.5
• Write out Theorem 2.4.12

• **Read Example 2.4.13** and use those ideas to list all possible abelian groups of order 90.

• **Homework 21**: §3.2/1,2,4,5,6 In these problems actually identify the given factor group (up to isomorphism) as well as finding the order.

• **Due**: Wednesday April 17