Things to study: Abstract Algebra

You should be able to show that…	You should be able to show that…
A subset of a ring is (or is not) a subring A subset of a ring is (or is not) an ideal A subset of a group is (or is not) a subgroup. A ring is or is not a field An element of a ring is or is not a zero divisor An element of a ring is or is not a unit.	A function is or is not 1-1 A function is or is not onto A function on rings is or is not a ring homomorphism A function on groups is or is not a group homomorphism An onto homomorphism of rings gives a ring isomorphism from the quotient ring (First Isomorphism theorem) A function $\mathbb{Z}_n \to \mathbb{Z}_m$ is or is not well defined

You should know some examples of rings, fields and groups:

Rings	Fields	Groups
$\mathbb{Z}$, $\mathbb{R}$, $\mathbb{Q}$, $\mathbb{C}$ $\mathbb{Z}_n$ $\mathbb{Z}[x], \mathbb{Q}[x], \mathbb{R}[x], \mathbb{Z}_n[x]$ 2×2 matrices Cross products of other rings	$\mathbb{R}$, $\mathbb{Q}$, $\mathbb{C}$ $\mathbb{Z}_p$ where p is prime.	$\mathbb{Z}$, $\mathbb{R}$, $\mathbb{Q}$, $\mathbb{C}$, $\mathbb{Z}_n$ $\mathbb{Z}[x], \mathbb{Q}[x], \mathbb{R}[x], \mathbb{Z}_n[x]$ $\mathbb{R}^*$, $\mathbb{Q}^*$, $\mathbb{C}^*$; $\mathbb{R}^{**}$, $\mathbb{Q}^{**}$ $Z_p{}^*$ where p is prime U_n, S_n, D_n

You should know at least one example of a ring and one example of a group that is not commutative.

You should be able to prove the properties of rings, fields and groups that were presented in class.

Some additional things to know how to do:
Long divide in $\mathbb{Q}[x], \mathbb{R}[x], \mathbb{Z}_p[x]$

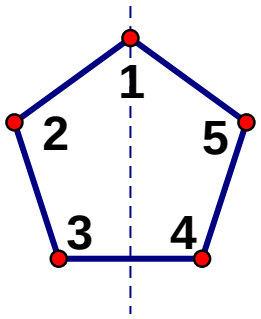
Find the order of an element of finite order (in a group) (for example, an element in $\mathbb{Z}_n$, S_n or D_n

Compose functions using the notation for the permutation group S_n and using the rotation and reflection notation in the dihedral group D_n

Find the inverse of an element in U_n, S_n or D_n

Some more dihedral group practice problems. In D_5 let r be a 72° rotation counter-clockwise. Let v be the vertical reflection (given the orientation shown).

a. Show the result of r^2v



b. What is the order of r?

c. What is the order of v?

d. Given that vr is a reflection, and therefore $vr = (vr)^{-1}$, find n so that $vr = r^n v$

e. Using the equation you found in d, find n and m so that $vr^3vr = r^n v^m$