Here is a list of general topics you should be familiar with for the second midterm. This list is not necessarily exhaustive, but it should give you a general idea of what I am expecting. More or less, this is just a list of the things we talked about in class and have been on the homework.

This exam will focus on Chapters 3 and 4.

Chapter 3

Section 3.1: Know the definition of a relation between two sets, be able to understand a relation as a list of ordered pairs. Know what the domain and range of a relation is.

Section 3.2: Know the definitions of reflexive, symmetric, and transitive. Know the definition of an equivalence relation. Be able to produce examples of relations with specific desired properties and be able to tell when a relation has these properties. Be able to prove that a given relation is an equivalence relation. Know what an equivalence class of an element is. Given an equivalence relation R on a set A know what A/R means.

Section 3.3: Know the definition of partition and the relationship between partitions and equivalence relations.

Section 3.4: Understand the relation "mod m" on $\mathbb{Z}$. Know what $\mathbb{Z}_m$ means. Understand $\overline{x}+\overline{y}$ and $\overline{x}\cdot\overline{y}$. Understand *inverses* in $\mathbb{Z}_m$ and what they can be used for. Know the cancelation laws in $\mathbb{Z}_m$ and know when then work (it depends on m). Be able to compute things in $\mathbb{Z}_m$, such as powers and products.

Chapter 4

Section 4.1: Know the definition of a function (as a special case of a relation). Be able to tell when a given relation is a function and when it is not. Know the difference between range and codomain.

Section 4.2: Understand function inverses (which are always relations, and not always functions) and composites.

Section 4.3: Know the defintions of injective (one-to-one) and surjective (onto). Be able to prove given functions have or do not have these properties.

Section 4.4: Know the definition of bijection, the definition of an inverse function, and know how to show that a function is a bijection (just show it is injective and surjective separately, usually).

A final comment

As in the previous exam, you also need to have good proof writing technique: define all variables you use, explain every step clearly, use English sentences (not just equations), prove things in the "correct direction" (don't prove a claim by assuming the claim and concluding something true), and make sure your proofs are always organized.