

## MIDTERM EXAM REVIEW

The exam will cover the following parts of Chapter 1.

- Section 1.1, up to and including Theorem 1.1.6.
  - Section 1.2, except for the Sieve of Eratosthenes (Example 1.2.1) and lattice diagrams (Example 1.2.2).
  - Section 1.3, up to and including Proposition 1.3.4.
  - Section 1.4 up to but *not* including Definition 1.4.7, plus Definition 1.4.9 and Proposition 1.4.10.
- (1) The following list consists of terms that you may be asked to define and theorems that you may be asked to state (and know by name).
- Divisor, multiple, divides (Def 1.1.1 p5).
  - $a\mathbb{Z}$  (p5).
  - Division algorithm (Thm 1.1.3 p7).
  - Greatest common divisor (Def 1.1.5 p8).
  - Relatively prime (Def 1.2.1 p16).
  - Prime (Def 1.2.4 p17).
  - Fundamental theorem of arithmetic (Thm 1.2.6 p18).
  - Least common multiple (Def 1.2.8 p20).
  - Congruence modulo  $n$  ( $a \equiv b \pmod{n}$ ) (Def 1.3.1 p24).
  - Congruence class of  $a$  modulo  $n$  ( $[a]_n$ ) (Def 1.4.1 p32).
  - $\mathbb{Z}_n$  (p33).
  - Zero divisor (Def 1.4.3 p35).
  - Invertible/inverse (Def 1.4.4 p35).
  - $\mathbb{Z}_n^\times$  (Def 1.4.9 p38).
- (2) The following list consists of Lemmas, Propositions, Theorems and Corollaries with which you should be familiar. The asterisk (\*) indicates that you may be asked to give the proof on the exam.
- Theorem 1.1.6 (p9), Proposition 1.2.2 (p16), Proposition 1.2.3\* (p16), Theorem 1.2.7\* (p19), Proposition 1.2.9 (p21), Proposition 1.3.2 (p24), Proposition 1.3.3\* (p25), Proposition 1.3.4\* (p8), Proposition 1.4.5\* (Proof for part a only; p36), Corollary 1.4.6 (p36), Proposition 1.4.10\* (p38).*
- (3) **Guarantees.** Your exam will have from 4 to 6 problems, some consisting of several parts.
- (40%) You will be asked to state some of the definitions and theorems listed in (1) above and to prove one or two of those marked with an asterisk in (2).
  - (10%) You will be given a new definition and asked to prove something, state examples, or answer questions about it.
  - (50%) You will be asked to prove statements, answer questions and provide examples involving the material on the lists above. The proofs (probably two, maybe three) will be in the style of fundamental homework problems, involving the material listed in (1) and (2).
- (4) On the proofs, you will receive substantial partial credit for completely explaining what you want to prove and what your assumptions are in the problems, even if you are not able to complete the proofs. On the other hand, you must state the definitions and theorems that you are asked to recall in a mathematically accurate way; please pay attention to the details! Little partial credit will be given for an incorrect definition.