

Study Guide for Exam 1

In what follows is a **brief** synopsis of what we have covered in Chapter 1, Appendix C, and Section 2.1. Use this list a guide to help you make up your own study guide.

On the exam, you can expect several proofs, TRUE/FALSE questions, and give-an-example-of type questions. The problems that have been assigned in class (but not necessarily graded) or very similar problems could appear on the exam; therefore it is **highly** recommended that you make every effort to complete those problems.

Exam 1 Topics:

1. Mathematical Induction and its use in proving a statement $P(n)$ for all positive integers n
2. Definition of divides, divisor, multiple, factor
3. Definition of gcd, lcm
4. Divisibility properties: 1.1 Exercises 3, 4, 5, 7, 17
5. The Division Algorithm and its more general case (Theorem 1.1 and Corollary 1.2)
6. Relationship between the quantities ab , (a, b) , and $[a, b]$ for positive integers a and b (1.2 Exercise 31(b))
7. The Euclidean Algorithm and back-solving to write (a, b) as a linear combination of a and b . (Theorem 1.6 and Lemma 1.7 (which is why the Euclidean Algorithm works))
8. Properties of gcd and lcm (see Theorem 1.3 and Corollary 1.4, 1.2 Exercise 31(a), Lemma 1.7)
9. Relatively prime integers (Theorem 1.5, 1.2 Exercises 12, 17, 24, 27(a))
10. Definition of a prime, a composite number, properties of primes (see Theorem 1.8, Corollary 1.9)
11. How to write a positive integer or two positive integers as products of primes
12. How to write divisors of a certain integer, i.e., if $d \mid a$ then what can you say about the prime powers in d with respect to the prime powers of a ?
13. The fundamental theorem of arithmetic and finding prime factorizations (Theorems 1.10, 1.11, 1.13)
14. Finding gcd and lcm from the prime factorization of two numbers (1.3 Exercise 11)
15. Definition and properties of congruence (Theorems 2.1 and 2.2)

16. Definition of congruence classes and their properties (Theorem 2.3 and its Corollaries 2.4 and 2.5)

17. Definition of \mathbb{Z}_n

To prepare for this test, you should make sure that you have done each of the following:

- **Rewritten your class notes.** Anything that I asked you to finish, make sure you know how to finish it. You should understand all of the proofs and be able to apply the proof techniques used in class to similar problems.
- **Finished all of the homework problems,** even the ones that are not graded. Just because a problem was not graded does NOT mean that it is unimportant. Similar questions could appear on the exam.

Problems that were not assigned but good to look at:

1.2: 18, 19, 22

1.3: 12, 13, 15, 17, 21

2.1: 5, 19, 28–30, 32

Appendix C: 6, 7