

## Math 1281 Christmas Exam Info Sheet

---

The purpose of this handout is to help you study by listing the concepts, definitions, and results you will need to know for the Christmas Exam.

Exam Information. The exam will take place on

**Monday Dec. 5, 2005 at 9:00 AM in ATAC 1001.**

You *must* bring your student ID. You will *not* be allowed to bring in any notes, use the text book, or use a calculator. You may leave your answers in an unexpanded form. For example, you may simply write  $C(23, 4)$ .

Material Covered. All the material discussed in class may appear on the exam. About 65% of the questions will focus on the material discussed since the last test. For a description of the material that we covered in Chapter 1 and Chapter 2, see the handout for the last test (copies of this handout can be found on the web). I have given below a breakdown of what you will need to know from Chapters 2, 3, 4 and 5 covered since the last test.

1. Section 2.4 You will need to know the definitions of the following terms:  $a$  divides  $b$ , factor, multiple, prime, gcd, lcm,  $a \bmod m$ ,  $a$  congruent modulo  $m$ . You will also need to be able to compute the gcd and lcm of two numbers. As well, you should be able to calculate  $a \bmod m$ .
2. Section 2.5 You will only need to know the material on the Euclidean Algorithm and how to use it.
3. Section 2.6 You will only need to know the material up to the bottom of page 185. So, you will need to know how to find linear congruences. You should be able to do problems of the types that we discussed in class. You do not need to know the material on public-key systems.
4. Section 3.1. You will not be tested directly on the material of this section.
5. Section 3.2. Know the difference between a sequence and a summation. Also, know the difference between an arithmetic and geometric progression. Know how to find a formula for a sequence, and how to do a summation over a set. You do not need to know the material on cardinality (pg. 233-236).
6. Section 3.3. You will have to do one or two proofs that involve induction. You do not need to know the material of pages 251-253.
7. Section 3.4. Know the definition of a recursive definition. Be able to evaluate a function that is defined recursively. As well, you should be able to give a recursive definition for a sequence and for a set. You do not need to know the material after Example 7 in this section.
8. Section 3.5. From this section you will only need to know the definition of a recursive algorithm and some examples of a recursive algorithm. Omit the material on the merge sort.
9. Section 4.1. Know the Sum Rule and the Product Rule. You should be able to do problems using these two rules like those given in class and in the homework assignments. As well, know the principle of inclusion-exclusion, and the definition of a tree.
10. Section 4.2. Know both the Pigeonhole Principle and the Generalized Pigeonhole Principle. I expect you to be able to use these principles in problems similar to ones we did in class and in the homework.

11. Section 4.3. Make sure you understand the difference between a permutation and combination. I expect you to remember Theorem 1 and Theorem 2, and how to use them. You will be expected to do problems like those discussed in class and the homework.
12. Section 4.4. Know how to use the Binomial Theorem. As well, memorize Pascal's Identity. You should be able to show, via algebraic manipulation, identities involving binomial coefficients (similar to Question 22 of the homework.)
13. Section 4.5. Know how to count the number of permutations when repetition is allowed. Also, know how to count the number of combinations when repetition is allowed. I will expect you to be able to answer problems like Example 5. Also, know how to apply Theorem 3. The material on page 341 can be omitted.
14. Section 4.6 Know how to put permutations in order according to the lexicographical ordering. As well, you should be able to find the next biggest permutation (see Example 2). You can skip the material on combinations.
15. Section 5.1 Know the definition of an experiment, sample space, event, and probability. You should also be able to calculate some probabilities.
16. Section 5.2 Be able to assign probabilities, like Example 1. Know Definition 1, and how to use it to compute the probability of an event. Also, know how to compute the conditional probability of an event, and know what it means for two events to be independent. As well, know what a Bernoulli trial is, and the definition of a random variable. You can ignore the material after the subsection on random variables.

**Exam Format** The exam is out of 75 points. It will have three parts:

**Part A** Short Answer Questions - Do all the questions (15 questions worth 2 pts each + one matching question worth 10pts = 40 pts)

**Part B** Long Answer Questions - Do all the questions (5 questions worth 5 pts each = 25 pts)

**Part C** Longer Answer Question - There will be two questions. You pick only *one* (1 question worth 10 pts)

**Important Note:** Before the exam, I will try to post all the homework marks on my office door and on the web. Make sure you check out your grade to check for errors.

Good Luck on your Exams! – Adam