

Spring 2023 COT 3100 Exam #2 Review

Exam Date and Time

Date: THURSDAY, MARCH 9, 2023

Time: 1:30 – 2:45 pm

Location: CB2-201

Exam Format

All Free Response – 75 points total separated into 3 parts:

Part A – Recitation Topics (Factorization, Algebra) – 15 points

Part B – Number Theory – 25 points

Part C – Induction – 35 points

Exam Aids

**ONE SHEET OF NOTES (8.5" x 11") FRONT AND BACK
CALCULATOR**

I. Recitation Problems

- a. Using Integer Information to Restrict Possibilities**
- b. Factorial Prime Factorization**
- c. Number of Divisors of an Integer**
- d. Factoring formula, using for divisibility, divisors**
- e. Age Problems**
- f. Work Problems**
- g. Clock Problems**
- h. Mixture Problems**

II. Number Theory

- a. Division Algorithm**
- b. Euclid's Algorithm**
- c. Extended Euclid's Algorithm**
- d. Full Solution to $ax+by = c$ for integers given a,b,c .**
- e. Finding modular inverses**
- f. Divisibility proofs**
- g. Pi notation**
- h. Fundamental Thm of Algebra**
- i. Least Common Multiple (LCM)**
- j. Connection between LCM and GCD**
- k. Calculating # of divisors of an integer.**
- l. Calculating the sum of divisors of an integer.**
- m. Calculating the number of times prime p divides into $n!$**

III. Mathematical Induction + Background

- a. Arithmetic Series - solving for terms, sums, etc.**
- b. Geometric Series - solving for terms, sums, etc.**
- c. How to recursively define sequences**
- d. Definition of summation notation**
- e. Summation Rules**
- f. Telescopic sum idea**
- g. Matrix Addition, Subtraction, Multiplication**
- h. Base Case**
- i. Inductive Hypothesis**
- j. Inductive Step**
- k. Summation Rules**
- l. Not all induction problems use summations**
- m. How to deal with inequalities**
- n. Strong Induction**
- o. Divisibility Problems**
- p. Matrix Exponentiation Problems**
- q. Problems with recursively defined sequences**
- r. Problems with Harmonic numbers**
- s. Unorthodox Examples - NIM, Nuggets, Trominos**

What to Study

- 1) Read the notes.
- 2) Practice problems posted online in my archive. (Do some.)
- 3) Look over written lectures and past homework solutions, looking for common solution ideas.

Exam Procedure

Please try to come early.

If you come by 1:25 pm, please do NOT sit in the first two rows. These seats are for late-comers.

At 1:25 pm, we'll start passing out the exams. Three of us will each pass out one sheet of paper. MAKE SURE YOU PUT YOUR NAME ON ALL THREE SHEETS.

If you come late, wait till we finish passing out the exam to the rest of the class.

Then, we'll give you all three parts separately.

If you finish early, please come up front and turn in the three parts and the formula sheet in separate stacks.

If you are working until time is called, please bring up all four sheets together and hand them directly to one of the proctors. We will sort everything out later.