



LUNDS
UNIVERSITET

Tentamensskrivning
Diskret matematik
Onsdag den 27 maj 2009
Skrivtid: 8.00–13.00

Matematikcentrum

Matematik NF

Inga hjälpmedel. Använd institutionens papper, skriv på bara den ena sidan och högst en uppgift på varje papper. Skriv tydligt, ge klara och kortfattade motiveringar, rita gärna figur i förekommande fall och ge tydliga svar. Fyll i omslaget fullständigt och skriv initialer på varje papper.

No books, notes, computational devices etc. are allowed. Use paper supplied by the department, write only on one side of each paper, and treat at most one exercise on each paper. Use clear handwriting and give clear careful motivations. Fill in the form completely and write your name on each sheet of paper.

1. Solve the recursion problem

$$\begin{cases} a_{n+2} - 2a_{n+1} + 2a_n = n, & n = 0, 1, 2, \dots, \\ a_0 = 2, & a_1 = 5. \end{cases}$$

2. Solve the system of congruences

$$\begin{cases} x \equiv 1 \pmod{2}, \\ x \equiv 3 \pmod{7}, \\ x \equiv 4 \pmod{11}, \end{cases}$$

that is, find all integer solutions x for the above set of congruences.

3. Calculate the number of equivalence relations on the set $\{1, 2, 3, 4\}$.
4. Calculate the number of positive integers n in the range $1 \leq n \leq 123$ that are not divisible by 2, 3 or 7.
5. Calculate the number of triples (n_1, n_2, n_3) of positive integers such that

$$n_1 n_2 n_3 = 20000.$$

6. Calculate the exponential generating function

$$F(x) = \sum_{n=0}^{\infty} F_n \frac{x^n}{n!}$$

for the sequence of Fibonacci numbers $\{F_n\}_{n=0}^{\infty}$ defined by

$$\begin{cases} F_{n+2} = F_{n+1} + F_n, & n = 0, 1, 2, \dots, \\ F_0 = 1, & F_1 = 1. \end{cases}$$