Exercise 1: (Modular Power)

Program iteratively the function `powermod` of the lecture, which for given integers $a, n, p \in \mathbb{N}_{\geq 0}$ and $p \in \mathbb{N}_{\geq 1}$ determines the modular power $a^n \bmod p$. Use for that purpose the binary representation of n.

(8 points)

Exercise 2: (EAN, ISBN)

An EAN-13 barcode (European Article Number), which is scanned on articles at the cashpoint of supermarkets, is a 13 digit barcode (12 data and 1 check digit) $a_1 a_2 \cdots a_{13}$ where the last digit a_{13} is a check digit satisfying the equation

$$1 \cdot a_1 + 3 \cdot a_2 + 1 \cdot a_3 + 3 \cdot a_4 \cdots + 1 \cdot a_{11} + 3 \cdot a_{12} + 1 \cdot a_{13} \equiv 0 \pmod{10} .$$

Similarly an ISBN (International Standard Book Number) is a 10 digit barcode $b_1 \cdots b_{10}$ where b_{10} is also a check digit satisfying this time the equation

$$\sum_{k=1}^{10} k a_k \equiv 0 \pmod{11} .$$

If $a_{10} = 10$, then X is printed.

Program the functions `EANcheck` resp. `ISBNcheck` which check if there is an error on a given EAN-13 resp. ISBN barcode and apply them on some examples, in particular to the book *Koepf, W.: Computeralgebra*, see Figure.

(8 points)

Deadline: at the latest Thursday, 04.07.2013, 08.15 h to nana@mathematik.uni-kassel.de. More informations under http://www.mathematik.uni-kassel.de/~koepf/ca-SS2013.html