1. Calculate $|121/122|_2$, $|45/999|_3$ and $|833/111|_7$.

2. Give an example of a sequence $q_1, q_2, q_3, \ldots$ of rational numbers such that for all primes $p$,
   \[ \lim_{n \to \infty} |q_n|_p = 0 \quad \text{and} \quad \lim_{n \to \infty} |q_n| = 1. \]

3. Let $p$ be a prime number. Prove that there does not exist a $p$-adic integer $\alpha$ such that $\alpha^2 = p$.

4. Let $a, b \in \mathbb{Q}$. Prove that if $|a|_p = |b|_p$ for all primes $p$, then $a = b$ or $a = -b$.

5. Produce the first four output bits of a binary Galois FCSR that has seven cells and feedback to 1st, 3rd, 4th and 7th cell (counting from the left) and initial state of all ones (and initially zeros in carries).

6. A binary Galois FCSR with 6 cells has feedback to the 1st, 4th and 5th cell (counting from the left). The initial state is 000001 with zeros in carries. Find the connection integer and the initial state integer. Use either Theorem 5 or the formulas after Example 33 to compute the first four output bits.