

Exercise Sheet 7

Exercise 7.1. Count the number of linear cyclic codes of length 8 over \mathbb{F}_3 .

Exercise 7.2.

1. Design a 3 error-correcting BCH code of length 31 and dimension 16 over \mathbb{F}_2 .
2. Suppose that $S_i = X^i + Y^i + Z^i$ (for $i = 1, \dots, 6$) are the syndromes for a received word. Write expressions for $\sigma_2 = XY + YZ + XZ$ and $\sigma_3 = XYZ$ as rational functions in S_1, \dots, S_6 .
3. Design a decoding algorithm for the code.

Exercise 7.3. Let p be an odd prime. Suppose that we have an unknown line in \mathbb{F}_p^2 , and are given a set $\{(\alpha, y_\alpha) : \alpha \in \mathbb{F}_p\}$ such that for all but $(p-3)/2$ of the choices of α , y_α is the evaluation of the line at point α . Show that it is possible to uniquely determine the equation of the line from the given information, and design an algorithm that finds the line.