Sheet 2

- Let C be a ternary repetition code of length 4 over the alphabet $\{0, 1, 2\}$. How many words are decoded to 1111 using minimum Hamming distance decoding?

- Determine whether each of the following is a valid error-correcting code (Perfect Code) or not. Justify your answer.
  (a) $[8, 5, 3]_2$
  (b) $[43, 42, 2]_2$
  (c) $[17, 18, 3]_3$
  (d) $[11, 5, 5]_2$

- A binary code has a minimum Hamming distance of 7. How many errors can it **detect** and how many can it **correct**?

- Given a message $(x_1, x_2, x_3, x_4) \in \{0, 1\}^4$, its corresponding codeword is given by

$$C_H(x_1, x_2, x_3, x_4) = (x_1, x_2, x_3, x_4, x_2 \oplus x_3 \oplus x_4, x_1 \oplus x_3 \oplus x_4, x_1 \oplus x_2 \oplus x_4).$$

  Find: q, n, K, R, d, error correction capability, error detection capability, and erasure correction capability.

- Let C_1 be the binary code of block length 14 consisting of all sequences in which there are at least three 0s between any two 1s. Find the rate of C_1.

- The minimum distance of a perfect code must be:
  (a) even
  (b) odd
  (c) even or odd
  (d) no correct answer