

Please solve the following exercises at home prior to the tutorial

Exercise 1

You've already learned about the checksum process for the „International Standard Book Number“ (ISBN) in the context of non-binary code integrity checks.

A similar process is used for the „European Article Number“ (EAN). Here, the digits are multiplied by 1 and 3 alternatingly. The difference of this sum to the next multiple of 10 is the checksum. Show that the following EAN code is correct (the checksum is the rightmost digit):



Show that

- Single incorrect digits are guaranteed to be detected
- Swapping the places of two digits cannot be detected in all cases

Exercise 2

To secure data transmissions against random bit errors an often-used tool is Cyclic Redundancy Check (CRC).

We now use CRC-7, i.e., an 8-bit generator.

The generator is: $A6_{(16)}$

The received data transmission incl. CRC is: $558BAA_{(16)}$

Check if any errors occurred during the data transmission.

The following exercises will be done during the tutorial

Exercise 3

A (31,26) Hamming-Code is used for error correction.

- a) How many payload and error-correction bits does each code word have?
- b) At which positions in the code word are the parity bits? Which data bits belong to each parity bit?
- c) We receive the code word 35 3A D6 $16_{(16)}$. Check for errors and correct those if present. What is the actual data sent?