IGCSE COMPUTER SCIENCE • EXERCISE SHEET

2.2 Methods of error detection

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

Objective

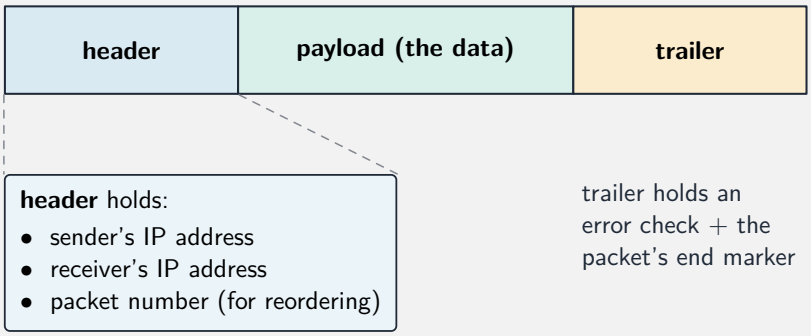
Build the skills to answer exam questions on **error detection** 错误检测—**parity check** 奇偶校验, **checksum** 校验和, **ARQ** 自动重传请求, and **check digit** 校验码.

You must be able to:

- work out a parity bit and detect a parity error
- describe checksum, echo check and ARQ
- describe a check digit and the errors it catches

1 Worked examples

Parity and ARQ



The trailer carries an error check; the receiver checks the data arrived correctly

- **even parity:** total number of 1s must be even; add a parity bit to make it so.
- **ARQ:** receiver sends an acknowledgement; no positive one before the timeout → resend.

2 Practice

2.1 State what a parity bit is used for. [1]

2.2 State one error a check digit can detect. [1]

3 Exam-style questions

3.1 Using **even** parity, the parity bit for the data `1101001` is: [1]

- **A** 0
- **B** 1
- **C** either
- **D** none

3.2 Data is checked using a checksum.

(a) Describe how a checksum detects an error. [2]

(b) Explain why a parity check might fail to detect an error. [2]

3.3 Describe how Automatic Repeat reQuest (ARQ) ensures data arrives correctly. [2]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **2.2 Methods of error detection** past-paper sheet in the Library, or try these in **Practice mode**:

- 0478/13 J25 —Q7 (error detection)
- 0478/12 N24 —Q5 (parity / checksum)

Solutions

2.1 to detect an error in a byte after transmission.

2.2 any of: an incorrect digit; a transposition error; a missing/extra digit.

3.1 A. `1101001` already has four 1s (even), so the even-parity bit is `0`.

3.2 (a) the checksum is calculated from the data before sending and re-calculated at the receiver; if the two values differ, an error has occurred.
(b) if two bits flip, the number of 1s may still be correct, so the parity check passes despite the error.

3.3 the receiver sends a positive or negative acknowledgement; if the sender gets no positive acknowledgement before a timeout, it resends the packet.