IGCSE Computer Science

Revision Sheet · 考前速记

Learn these by heart before the exam. 考试前把这些内容背熟。

Data representation

Binary → denary: add the place values (128 64 32 16 8 4 2 1) where the bit is 1.

1 nibble = 4 bits, 1 byte = 8 bits; 1 KiB = 1024 bytes, 1 MiB = 1024 KiB.

Hexadecimal 十六进制: base 16 (0-9, A-F); each hex digit = 4 binary bits – a short way to write binary

Sound: sample rate (samples per second) and bit depth set quality and file size.

Images: resolution (pixels) × colour depth (bits per pixel) = file size.

Compression 压缩: lossless keeps all data and reverses exactly (text); lossy removes detail to shrink more (photos, music)

Networks and the internet

LAN = one site; WAN = wide area (the internet). MAC address = hardware, IP address = network.

Packet 数据包: data split into small parts, each with a header (addresses) and a trailer; reassembled at the end

Encryption 加密: scrambling data with a key so that only the intended receiver can read it

Protecting data: firewall, strong passwords, two-factor authentication, anti-malware, encryption.

Threats: malware (virus, worm, trojan, ransomware, spyware), phishing, pharming, brute-force, DoS.

Logic and the CPU

Logic gates: AND (both 1), OR (either 1), NOT (invert), NAND, NOR, XOR (different inputs → 1).

Von Neumann / fetch-execute 取指-执行周期: the CPU fetches an instruction from memory, decodes it, then executes it – repeatedly

More cores, higher clock speed and a larger cache all make a CPU faster.

RAM (volatile, working memory) vs ROM (non-volatile, holds the bootup/BIOS).

Storage: magnetic (HDD), solid-state (SSD, flash), optical (CD/DVD).

Algorithms and programming

Algorithm 算法: a precise step-by-step set of instructions to solve a problem; shown as pseudocode or a flowchart

Linear vs binary search 线性与二分查找: linear checks each item in turn; binary repeatedly halves a SORTED list – much faster

Bubble sort: compare neighbours and swap, repeating passes until no swaps are needed.

Constructs: sequence, selection (IF / CASE), iteration (FOR, WHILE, REPEAT).

Variable and constant 变量与常量: a variable's value can change while the program runs; a constant's cannot

Data types: integer, real, char, string, Boolean. Validation checks input is sensible (range, type, length).

Databases and system design

Primary key 主键: a field that uniquely identifies each record in a table

Testing data: normal (valid), boundary (edge of a range), erroneous (should be rejected).

Pseudocode array: DECLARE Nums : ARRAY[1:10] OF INTEGER; loop with FOR i ← 1 TO 10.

The systems life cycle: analysis → design → build → test → implement → maintain.