

Grade 8 checklist

33 skills. Tick each one when you can do it. For grade 8 you need the skills for the grades below it too.

Computer systems (Paper 1)

- ☐ **Trace register contents through an instruction** Given an instruction, an address and the value stored there, state what the PC, MAR, MDR and accumulator hold at each step. (Architecture of the CPU)
- ☐ **Weigh up characteristics that point different ways** Decide, for example, whether a faster clock or more cores matters more, depending on whether the software can use several cores. (CPU performance)
- ☐ **Recommend and justify a memory upgrade** Explain why more RAM reduces the use of virtual memory, and why other upgrades may not help as much. (Primary storage (RAM, ROM, cache, virtual memory))
- ☐ **Justify why alternatives are less suitable** Explain why the other options would not work as well, not just why your choice does. (Secondary storage)
- ☐ **Work with 1000 and 1024 conventions** Know that 1 KB can be taken as 1000 or 1024 bytes and use whichever the question states. (Units and capacity)
- ☐ **Solve problems combining shifts and addition** E.g. multiply by 10 by adding the results of a left shift of 3 places ($\times 8$) and a left shift of 1 place ($\times 2$), and spot when overflow will happen. (Binary addition, overflow and shifts)
- ☐ **Calculate the bits needed for a character set** Find the smallest n for which 2^n is at least the number of characters needed. (Characters: ASCII and Unicode)
- ☐ **Compare file sizes after changes** Use ratios, e.g. halving the width and height leaves a quarter of the pixels and a quarter of the file size. (Images)
- ☐ **Compare recordings using ratios** E.g. 4 times the sample rate and 2 times the bit depth gives a file 8 times as large. (Sound)
- ☐ **Evaluate compression choices in a scenario** Weigh storage, download time, bandwidth and the quality the user needs. (Compression)
- ☐ **Explain why more bandwidth may not fix lag** When small amounts of data are sent many times a second, the delay (latency) matters more than the bandwidth. (LANs, WANs and network performance)
- ☐ **Evaluate moving an organisation to the cloud** Weigh the benefits against the risks for the organisation described and reach a supported conclusion. (The Internet, DNS, hosting and the cloud)
- ☐ **Explain what encryption cannot protect against** It does not stop data being intercepted or deleted, and does not help if the attacker has the key. (Encryption)
- ☐ **Describe an email's journey naming protocols** SMTP to send and to pass between mail servers, POP or IMAP to retrieve, TCP/IP throughout. (Standards and common protocols)
- ☐ **Explain how data passes through the layers** At the sender each layer adds its header on the way down; at the receiver each layer removes its header on the way up. (The concept of layers)
- ☐ **Discuss threats and their impact on organisations** Explain how several attacks could happen to the organisation described and what their effects would be. (Threats to computer systems and networks)

- ☐ **Evaluate the security for an organisation** Recommend and prioritise a combination of methods suited to the organisation's data, budget and staff. (Identifying and preventing vulnerabilities)
- ☐ **Write a balanced 8-mark discussion** Cover each type of issue asked for, apply it to the scenario, give both sides and reach a conclusion. (Ethical, cultural, environmental and privacy issues)
- ☐ **Discuss legal issues in an unfamiliar scenario** Link each action to the relevant law and consider the responsibilities of everyone involved. (Legislation)
- ☐ **Evaluate open source for an organisation** Discuss cost, support, compatibility, training and security in an extended answer with a conclusion. (Open source and proprietary software)

Algorithms and programming (Paper 2)

- ☐ **Refine an algorithm to meet new requirements** Change an existing algorithm, such as adding validation or a counter, without breaking it. (Pseudocode and flowcharts)
- ☐ **Trace nested loops and selection accurately** Keep track of inner and outer loop counters and which branch runs each time. (Trace tables and common errors)
- ☐ **Work out the maximum number of comparisons** Binary search halves the list each time, so 1000 items need at most 10 comparisons. (Linear and binary search)
- ☐ **Evaluate bubble sort against other sorts** Simple and memory-efficient, but slow for large lists compared with merge sort. (Bubble sort)
- ☐ **Choose a suitable sort for a scenario** Justify merge sort for large data sets, or another sort when memory or simplicity matters. (Merge sort)
- ☐ **Compare insertion, bubble and merge sort** Weigh up speed on large lists, memory use and how sorted the data already is. (Insertion sort)
- ☐ **Use nested selection and iteration** Put loops and if statements inside each other, with correct indentation and logic. (Sequence, selection and iteration)
- ☐ **Write functions that process strings** For example count vowels, check a password's characters or build a code. (String manipulation)
- ☐ **Process a 2D array with nested loops** Use an outer loop for one index and an inner loop for the other. (Arrays and records)
- ☐ **Write a simulation or game using random** Combine random numbers with loops, counters and selection correctly. (Random number generation)
- ☐ **Explain the limits of validation** Validation checks data is sensible, not that it is correct. (Defensive design)
- ☐ **Turn a written problem into logic** Write an expression and truth table for a scenario, such as an alarm system. (Logic gates, diagrams and truth tables)
- ☐ **Use arrays, files or sub programs in solutions** Store and process data with the right structure, such as an array of names. (Paper 2 Section B practice: design, write, test and refine)

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