

Grade 3 checklist

54 skills. Tick each one when you can do it. For grade 3 you need the skills for the grades below it too.

Computational thinking

- ☐ **Define decomposition** Breaking a problem down into smaller sub-problems that are each easier to understand and solve. (Decomposition and abstraction)
- ☐ **Define abstraction** Removing or hiding unnecessary detail so that you can focus on what matters for the problem. (Decomposition and abstraction)
- ☐ **Name the standard flowchart symbols** Terminal, process, decision, input/output and subprogram symbols, joined by arrows. (Flowcharts, pseudocode and program code)
- ☐ **Define variable and constant** A variable's value can change while the program runs; a constant's value does not. (Variables, constants and data structures (strings, arrays and records))
- ☐ **Use the four basic arithmetic operators** Add, subtract, multiply and divide, knowing that / gives a real number. (Arithmetic, relational and logical operators)
- ☐ **Follow a short sequence to find the output** Work through a few assignments and a print statement in order. (Tracing algorithms and trace tables)
- ☐ **Name the three types of error** Syntax, logic and runtime errors. (Syntax, logic and runtime errors)
- ☐ **Describe how a linear search works** Check each item in turn from the start until the item is found or the list ends. (Linear and binary search)
- ☐ **State the outputs of AND, OR and NOT** AND needs both inputs to be 1; OR needs at least one; NOT reverses its input. (Truth tables and logic)

Data

- ☐ **State why computers use binary** Computers are built from switches (transistors) that have two states, on and off, which represent 1 and 0. (Binary representation and unsigned binary–denary conversion)
- ☐ **Name the kinds of data stored in binary** Numbers, text, images, sound and program instructions are all stored as binary patterns. (Binary representation and unsigned binary–denary conversion)
- ☐ **Define a character set** A list of the characters a computer can represent, each with its own unique binary code. (Characters and ASCII)
- ☐ **Define pixel** The smallest single-coloured element (dot) of a bitmap image. (Bitmap images)
- ☐ **State that sound is analogue** Sound is a continuous wave, so it must be sampled before it can be stored in binary. (Sound)
- ☐ **Put the units of storage in order** bit, nibble, byte, kibibyte, mebibyte, gibibyte, tebibyte. (Units and file size calculations)
- ☐ **Give reasons for compressing files** Compressed files use less storage space and transfer faster, using less bandwidth. (Lossless and lossy compression (incl. RLE))

Computers

- ☐ **State what main memory holds** Main memory (RAM) holds the program instructions and the data that are currently in use. (Stored program concept and von Neumann architecture)

- ☐ **Name the four main parts of the CPU** Control unit (CU), arithmetic logic unit (ALU), registers and clock. (CPU components and the fetch–decode–execute cycle)

- ☐ **Define volatile and non-volatile** Volatile memory (RAM) loses its contents when the power is off; non-volatile storage keeps them. (Main memory and secondary storage)

- ☐ **Give examples of each type of storage** Magnetic: hard disk drive; optical: CD, DVD, Blu-ray; solid state: SSD, USB flash drive, memory card. (Main memory and secondary storage)

- ☐ **Define an embedded system** A computer system inside a larger device that carries out a dedicated function. (Embedded systems)

- ☐ **Give examples of embedded systems** For example a washing machine, microwave oven, central heating thermostat, car engine management system or traffic lights. (Embedded systems)

- ☐ **State the purpose of an operating system** It manages the hardware and software, and provides a platform for applications and an interface for the user. (Operating systems)

- ☐ **Name the four functions of an operating system** File management, process management, peripheral management and user management. (Operating systems)

- ☐ **State the purpose of utility software** It maintains, protects or improves the performance of a computer system. (Utility software)

- ☐ **Name the five utilities in the specification** File repair, backup, data compression, disk defragmentation and anti-malware. (Utility software)

- ☐ **Define robust software** Software that keeps working correctly, without crashing, even with unexpected input or when attacked. (Robust software: audit trails and code reviews)

- ☐ **State what machine code is** Instructions in binary that the CPU can execute directly, without translation. (Programming languages and translators)

Networks

- ☐ **State what LAN and WAN stand for** LAN stands for local area network and WAN stands for wide area network. (LANs, WANs and why computers are connected)

- ☐ **Define the internet** The internet is a worldwide network of interconnected networks. (The internet: IP addressing and routers)

- ☐ **State how data travels in each medium** Electrical signals in copper cable, pulses of light in fibre-optic cable and radio waves for Wi-Fi. (Wired and wireless connectivity and performance)

- ☐ **State the unit of network speed** Network speed is measured in bits per second (bps), with kbps, Mbps and Gbps for larger rates. (Network speeds and transmission time)

- ☐ **Define a network protocol** A protocol is a set of rules that govern how data is transmitted between devices. (Protocols)

- ☐ **Name the four layers in order** From the top: application, transport, internet, link. (The TCP/IP model)

- ☐ **Identify bus, star and mesh from diagrams** Bus: one backbone cable; star: every device cabled to a central switch; mesh: devices joined to several others. (Network topologies)

- ☐ **Give reasons why network security is important** To stop data being stolen, changed or deleted, and to keep systems working. (Network security and identifying vulnerabilities)
- ☐ **State the purpose of a firewall** A firewall blocks unauthorised traffic entering or leaving a network. (Protecting networks)

Issues and impact

- ☐ **Define e-waste** E-waste is electronic and electrical equipment that has been thrown away, such as old phones, laptops and chargers. (Environmental issues)
- ☐ **Give environmental problems of making devices** Mining raw materials damages habitats, factories use a lot of energy and water, and both cause pollution. (Environmental issues)
- ☐ **Define personal data** Information about a living person who can be identified from it, such as a name, address or photo. (Personal data: privacy, ownership, consent and data protection)
- ☐ **Give examples of personal data collected** For example name, date of birth, email address, location, bank details and health information. (Personal data: privacy, ownership, consent and data protection)
- ☐ **Define artificial intelligence** AI is a computer system that carries out tasks that normally need human intelligence, such as recognising speech. (Artificial intelligence, machine learning and robotics)
- ☐ **Give uses of AI and robots** For example, medical scan analysis, fraud detection, chatbots, self-driving cars and warehouse robots. (Artificial intelligence, machine learning and robotics)
- ☐ **State what copyright protects** Original work such as source code, images, music and text; the protection applies automatically. (Intellectual property and licensing)
- ☐ **Match a protection method to an item** Code → copyright, invention → patent, logo or name → trademark, permission to use software → licence. (Intellectual property and licensing)
- ☐ **Define malware and give examples** Malware is software designed to cause harm, e.g. viruses, worms, Trojans, ransomware and key loggers. (Malware, social engineering and technical vulnerabilities)
- ☐ **Give ways to protect against malware** Up-to-date anti-malware, installing patches promptly, and not opening unexpected attachments or links. (Protecting digital systems and data (incl. encryption))
- ☐ **Define encryption, plaintext, ciphertext and key** Encryption uses an algorithm and a key to turn plaintext into ciphertext that cannot be understood without the key. (Protecting digital systems and data (incl. encryption))

Problem solving with programming

- ☐ **Name the three types of program error** Syntax, logic and runtime errors, with an example of each. (Developing code: readability, errors, validation and testing)
- ☐ **Recognise sequence, selection and iteration in code** Point out the lines that run in order, the lines that make a decision and the lines that repeat. (Sequence, selection and iteration)
- ☐ **Name the primitive data types** Integer, real, Boolean and character, which Python stores as int, float, bool and str. (Data types and data structures)
- ☐ **Take input and display output** Use input() with a clear prompt and print() to show the results. (Input, output and file handling)
- ☐ **Use +, -, * and / correctly** Know that / always gives a real result, e.g. 8 / 2 gives 4.0. (Operators)

☐ **Call built-in subprograms such as len()** Use pre-existing subprograms such as len(), print(), int() and round() with the right arguments. (Subprograms and libraries)

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