Pearson Edexcel

GCSE (9-1) Computer Science

Scheme of Work (SoW)

Pearson Edexcel Level 1/Level 2 GCSE (9-1) in Computer Science (1CP2)

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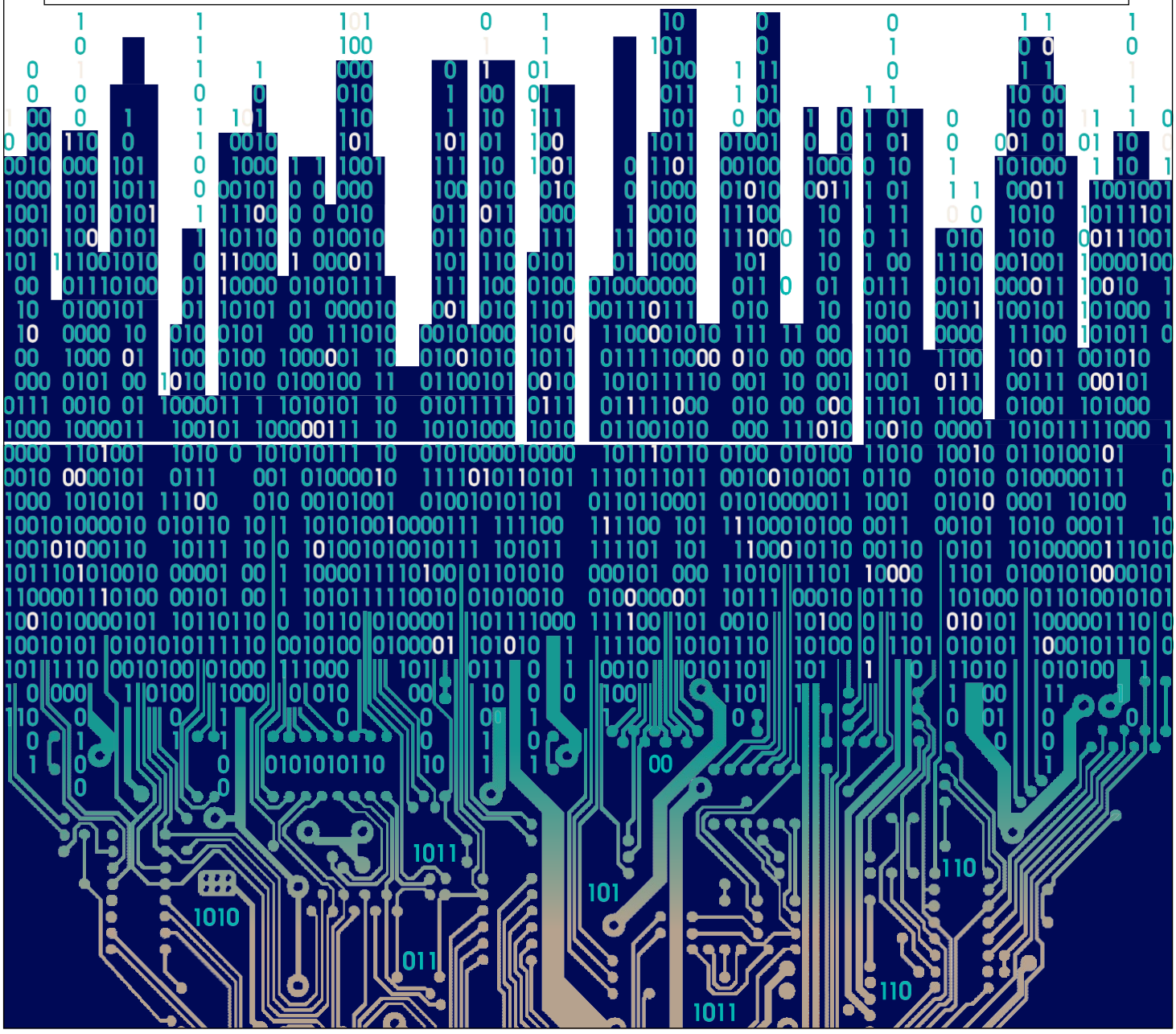

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All information in this specification is correct at the time of going to publication.

Scheme of Work: GCSE Computer Science 2020

Contents

Scheme of Work

Teacher notes

This is the Edexcel GCSE (9-1) Computer Science SoW. This is your course planner. The iSoW provides more detailed lesson plans, activities and resources as well as activity solutions. These can also be found on the Edexcel website.

The SoW follows two parallel strands, split between Computational Thinking (the programming aspects covered in Topics 1 & 6) and the Principles of Computer Science (the theory covered by Topics 1 – 5)

There are 120 1-hour lessons.

The SoW is divided into 6-week blocks, with an assessment at the end of each block.

– Six blocks in Year 10 (36 lessons for each strand) and four blocks in Year 11 (24 lessons for each strand).

The SoW has been produced as guidance for your planning. There is some degree of flexibility, particularly in the theory strand. Topics can be taught in a different order.

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-01 refers to Year 10 Half Term 1	*CT – Computational Thinking (Topic 1 & 6)* *Or P – Principles of Computer Science (Topics 1 – 5)* *Lessons are labelled in sequence, so CT1, CT2, CT3*	*This is the lesson title.* *Each half term is shaded in a different colour to help you identify them.*	*Here we outline all of the things that students will learn, these are not necessarily the lesson outcomes.*	*References to the specification.*

Version 1.2 was released in September 2020. It incorporates changes to Yr 10-6 lesson titles and amends to coverage specification references and lesson objectives in these four lessons. The changes are highlighted in yellow.

Overview

	1	2	3	4	5	6
Y10-1	*Introduction to programming*	*Decomposition, algorithms*	*Data types, variables*	*Input and integer functions, debugging tools*	*Flowcharts*	*Assessment*
	Course introduction	*Binary*	*Unsigned integers*	*Binary arithmetic*	*Two's complement 1*	*Assessment*
Y10-2	*String manipulation, string methods*	*if, if else, relational operators*	*if elif else, readability*	*Boolean operators*	*Repetition (while)*	*Assessment*
	Two's complement 2	*Logical binary shifts*	*Arithmetic binary shifts*	*Hexadecimal*	*ASCII*	*Assessment*
Y10-3	*One-dimensional lists*	*for loops, range function*	*Procedures*	*Functions*	*Subprograms*	*Assessment*
	Stored program concept	*Fetch-decode-execute 1*	*Fetch-decode-execute 2*	*Secondary storage 1*	*Secondary storage 2*	*Assessment*
Y10-4	*string.format( )*	*Two-dimensional lists*	*Validation*	*Linear search (one-dimensional)*	*Linear search (two-dimensional)*	*Assessment*
	Operating system	*OS: File management*	*OS: Process management*	*OS: Peripheral & user management*	*Utility software*	*Assessment*
Y10-5	*Merge sort*	*Reading files*	*String processing*	*Writing files*	*Authentica-tion*	*Assessment*
	Malware & anti-malware	*Hackers*	*Social engineering*	*Data level protection*	*Robust software*	*Assessment*

	1	2	3	4	5	6
Y10-6	*Turtle introduction, pens, and lines*	*Turtle movement, coordinates, polygons, subprograms*	*Turtle pens, colours, filling, and circle*	*Turtle combining subprograms, layers*	*Turtle big problem*	*Assessment*
	LANs & WANs	*Networks speed*	*Connectivity*	*Wired v. wireless*	*Network topologies*	*Assessment*
Y11-01	*Intro to programming*	*Subprograms*	*Local, global*	*Maths, time*	*Problem solving*	*Assessment*
	Embedded systems	*The Internet of Things*	*Packet switching*	*TCP/IP 1*	*TCP/IP 2*	*Assessment*
Y11-02	*Trace tables*	*Errors*	*Bubble sort*	*Binary search*	*Problem solving*	*Assessment*
	Environmental impact: manufacture & use	*Environmental impact: e-waste*	*Low-level & high-level languages*	*Translators*	*Intellectual Property*	*Assessment*
Y11-03	*Data types, string manipulation, validation*	*Data structures (one-dimensional)*	*Trace tables*	*Errors*	*Problem solving*	*Assessment*
	Bitmaps	*Bitmaps*	*Sound*	*Sound*	*Compression*	*Assessment*
Y11-04	*Data structures (two-dimensional)*	*Subprograms (local, global, procedures, functions)*	*Problem solving*	*Trace tables, errors*	*Problem solving, testing with data*	*Assessment*
	AI, machine learning & robotics 1	*AI, machine learning & robotics 2*	*Personal data*	*Privacy & ownership*	*Data protection legislation*	*Assessment*

Year 10

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-01	*CT1*	*Intro to programming*	*Define the term 'program'* *Identify types of programs used every day* *Identify Python as a programming language* *Access an integrated development environment* *Load and run a Python program* *Change a Python program* *Save a Python program* *Use arithmetic operators and BIDMAS* *Layout code to be readable and maintainable* *Correct errors in programs* *Use variables in algorithms and programs*	*1.2.1* *1.2.3* *1.2.5* *6.1.5* *6.2.1*
Y10-01	*CT2*	*Decomposition, algorithms*	*Define the term 'decomposition'* *Define the term 'algorithm'* *Decompose a problem* *Order the pieces of an algorithm (unplugged)* *Order the pieces of an algorithm (IDE)* *Define the term 'sequence' and use sequence in algorithms and program code* *Interpret error messages* *Correct errors in ordering*	*1.1.1* *1.2.1* *6.1.1* *6.1.4* *6.5.1*
Y10-01	*CT3*	*Data types, variables*	*Recognise primitive data types (int, real, char, string)* *Define the term 'variable'* *Create variables of all types* *Create meaningful identifier names* *Assign values to variables, with the correct data types* *View contents of memory (variable) in IDE*	*1.2.2* *1.2.5* *6.1.4* *6.1.5* *6.2.1* *6.3.1* *6.3.2*
Y10-01	*CT4*	*Input and integer functions, debugging tools*	*Take input and create output* *Define the term 'runtime error'* *Find and fix runtime errors* *Use primitive data types (integer, real, char, string)*	*6.1.5* *6.2.1* *6.3.1* *6.4.1* *6.6.1*
Y10-01	*CT5*	*Flowcharts*	*Translate code into flowchart symbols* *Represent an algorithm in a flowchart* *Translate a flowchart into code*	*1.2.1* *1.2.2* *1.2.3*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
				6.1.2 *6.1.3*
Y10-01	*CT6*	*Assessment*	*Represent algorithms in flowcharts* *Create code from algorithms represented in flowcharts*	*1.2.1* *6.2.1* *6.2.2* *6.4.1*
Y10-01	*P1*	*Course introduction*	*Define what is meant by the term 'digital computer'* *Give examples of different types of computer*	
Y10-01	*P2*	*Binary*	*Define what is meant by the terms 'binary' and 'bit'* *Explain why binary is used to represent data and program instructions in a computer* *Describe the relationship between the number of available bits and the range of unique values that can be represented* *Determine the number of unique values that can be represented by a binary pattern of a given length (2^n)*	*2.1.1* *2.1.2* *2.2.4* *2.3.1*
Y10-01	*P3*	*Unsigned integers*	*Define what is meant by the terms 'nibble' and 'byte'* *Convert between denary and 8-bit binary numbers*	*2.1.1* *2.1.2* *2.1.3* *2.2.4* *2.3.1*
Y10-01	*P4*	*Binary arithmetic*	*Add together two positive 8-bit binary integers* *Define what is meant by the term 'overflow error'* *Describe the effects of an overflow error*	*2.1.4* *2.1.5* *2.2.4*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-01	*P5*	*Two's complement 1*	*Differentiate between signed and unsigned integers* *Describe how positive and negative numbers are represented in two's complement* *Find the two's complement of a positive binary number*	*2.1.1* *2.1.2* *2.1.3* *2.2.4*
Y10-01	*P6*	*ASSESSMENT*	*Define what is meant by the terms 'bit', 'nibble' and 'byte'* *List three types of data represented in binary in a computer system* *Give the 8-bit binary equivalent of an unsigned denary number* *Give the denary equivalent of an unsigned 8-bit binary number* *Add together two positive 8-bit binary numbers* *Explain what is meant by an overflow error*	*2.1.1* *2.1.2* *2.1.3* *2.1.4* *2.1.5* *2.2.4* *2.3.1*
Y10-02	*CT7*	*String manipulation, string methods*	*Use string manipulation functions (index, left, right, upper, lower, isalpha, ..., etc.)*	*1.2.2* *1.2.5* *6.2.2* *6.3.1* *6.3.3* *6.6.1*
Y10-02	*CT8*	*if, if else, relational operators*	*Use relational operators in flowchart and code* *Use 'if' and 'if else' in code* *Use flowchart decision symbol*	*1.2.1* *1.2.3* *6.1.3* *6.2.1* *6.2.2* *6.5.2*
Y10-02	*CT9*	*if elif else, readability*	*Use relational operators in flowchart and code* *Use 'if' and 'if else' in code* *Use 'if elif else' in code* *Use flowchart decision symbol* *Use comments, white space, meaningful identifiers, and indentation in code* *Identify parts of code (variables, constants, selection, repetition)*	*1.2.1* *1.2.2* *1.2.3* *6.1.3* *6.2.1* *6.2.2* *6.5.2*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-02	*CT10*	*Boolean operators*	*Define 'AND', 'NOT' and 'OR'* *Construct truth tables for Boolean operators and combinations* *Use relational operators in flowchart and code*	*1.2.1* *1.2.3* *1.3.1* *6.1.2* *6.5.3*
Y10-02	*CT11*	*Repetition (while)*	*Use repetition (condition-controlled loops) in algorithms* *Use repetition (condition-controlled loops) in code* *Use repetition (condition-controlled loops) in flowcharts*	*1.2.1* *6.1.3* *6.2.2* *6.5.2* *6.5.3*
Y10-02	*CT12*	*Assessment*	*Use flowcharts to represent selection and repetition* *Identify parts of a program* *Solve problems using code* *Use repetition in code* *Use selection in code*	*1.2.1* *1.2.3* *6.1.1* *6.1.2* *6.2.1* *6.2.2* *6.3.1* *6.5.2* *6.5.3*
Y10-02	*P7*	*Two's complement 2*	*Convert between signed denary numbers and two's complement binary numbers* *Determine the range of values that can be represented in two's complement by a binary number of a given length*	*2.1.1* *2.1.2* *2.1.3* *2.2.4*
Y10-02	*P8*	*Logical binary shifts*	*Apply logical left and right shifts to binary integers* *Use logical binary shifts to multiply and divide unsigned binary integers by powers of 2* *Explain why a number may be less precise after a binary shift right has been applied*	*2.1.2* *2.1.3* *2.1.4* *2.2.4*
Y10-02	*P9*	*Arithmetic binary shifts*	*Apply arithmetic left and right shifts to signed binary numbers* *Describe how an arithmetic right shift differs from a logical right shift*	*2.1.2* *2.1.3* *2.1.4* *2.2.4*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-02	*P10*	*Hexadecimal*	*Define what is meant by the term 'hexadecimal'* *Explain why hexadecimal notation is used* *Convert between hexadecimal and binary*	*2.1.1* *2.1.6*
Y10-02	*P11*	*ASCII*	*Define what is meant by the term 'character set'* *Describe how characters are represented in 7-bit ASCII* *Given the ASCII code for one character derive the code for another* *Outline the shortcomings of ASCII and how encoding systems that use more bits overcome them*	*2.1.1* *2.2.1* *2.2.4*
Y10-02	*P12*	*ASSESSMENT*	*Apply a logical binary shift left to a positive 8-bit binary number* *Apply a logical shift right to a positive 8-bit binary number* *Explain why a binary number may become less accurate after a binary shift right* *Apply an arithmetic binary shift right to a two's complement number* *Give the hexadecimal equivalent of an 8-bit binary number* *Give the binary equivalent of a hexadecimal number* *Explain why hexadecimal is used* *Describe how characters are encoded in ASCII* *Derive the code for an ASCII character from that of another* *Describe the limitations of ASCII*	*2.1.4* *2.1.6* *2.2.1* *2.2.4*
Y10-03	*CT13*	*One-dimensional lists*	*Define the terms 'array' and 'list'* *Access each item in a list using indexing* *Create, append, delete items from a list*	*1.2.1* *1.2.2* *6.2.2* *6.3.1* *6.6.1*
Y10-03	*CT14*	*for loops, range function*	*Explain that the range() function generates a sequence of numbers* *Use iteration 'for' to process every item in a one-dimensional data structure*	*1.2.1* *1.2.2* *6.1.3* *6.2.2* *6.3.1*
Term	**Lesson**	**Lesson title**	**What students will learn**	**Spec.**

	number			ref.
Y10-03	*CT15*	*Procedures*	*Define the term 'procedure'* *Define the term 'parameter'* *Create procedures*	*1.1.1* *1.1.2* *6.1.1* *6.6.1* *6.6.2*
Y10-03	*CT16*	*Functions*	*Define the term 'function'* *Define the term 'return value'* *Create functions*	*1.1.1* *1.1.2* *6.1.1* *6.6.1* *6.6.2*
Y10-03	*CT17*	*Subprograms*	*Create functions* *Create procedures* *Use 'separation of concerns'*	*1.1.1* *1.1.2* *6.1.1* *6.6.1* *6.6.2*
Y10-03	*CT18*	*Assessment*	*Use 'lists'* *Use 'range()'* *Use 'for'* *Create procedures* *Create functions*	*1.2.1* *1.2.2* *6.6.1* *6.6.2*
Y10-03	*P13*	*Stored program concept*	*Define what is meant by the 'stored program concept'* *Describe the hardware components used in the von Neumann architecture and explain their role in the fetch-decode-execute cycle*	*3.1.1*
Y10-03	*P14*	*Fetch-decode-execute 1*	*Draw and label a diagram of the inside of a computer; label each hardware component and briefly describe its role* *Explain how the speed of the clock impacts on performance* *Explain how pipelining improves the performance of the CPU*	*3.1.1*
Y10-03	*P15*	*Fetch-decode-execute 2*	*Explain the relationship between the width of the address bus and the number of memory locations that can be addressed* *Calculate the number of addressable memory locations provided by an address bus of a specified width*	*3.1.1*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-03	*P16*	*Secondary storage 1*	*Explain why secondary storage is needed* *Describe how data are stored on magnetic, optical and solid-state media*	*3.1.2*
Y10-03	*P17*	*Secondary storage 2*	*Compare the capacity, speed and portability of magnetic, optical and solid-state storage devices* *Select an appropriate type of storage for a particular purpose* *Construct an expression to calculate data storage requirements*	*2.3.1* *3.1.2*
Y10-03	*P18*	*ASSESSMENT*	*Define what is meant by the term 'stored program concept'* *Describe what is stored in main memory when a program is running* *Explain what happens during the fetch-decode-execute cycle and the role of specified components* *Label and complete a diagram of the inside of a computer* *Explain the need for secondary storage* *Describe how data are stored on a solid-state drive*	*3.1.1* *3.1.2*
Y10-04	*CT19*	*string.format()*	*Format output to meet requirements* *Format output suitable for the end user*	*1.2.2* *6.3.1* *6.3.3* *6.6.1*
Y10-04	*CT20*	*Two-dimensional lists*	*Define the term 'array'* *Define the term 'list'* *Give characteristics of one-dimensional and two-dimensional data structures* *Use indexing to access any item in a two-dimensional structure* *Use 'for' to iterate over every item in a two-dimensional structure* *Use 'while' to find a row in a two-dimensional structure*	*1.1.2* *1.2.1* *1.2.2* *6.2.2* *6.3.1* *6.6.1*
Y10-04	*CT21*	*Validation*	*Validate input using presence check, length check, range check, pattern check*	*1.2.4* *6.3.1* *6.4.1* *6.4.3*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-04	*CT22*	*Linear search (one-dimensional)*	*Apply a linear search to a one-dimensional list (paper)* *Complete a linear search algorithm in a flowchart* *Write a linear search for a single item in a one-dimensional list (code)*	*1.1.* *1.2.1* *1.2.6* *6.2.2*
Y10-04	*CT23*	*Linear search (two-dimensional)*	*Apply a linear search to a two-dimensional list (paper)* *Complete a linear search algorithm in a flowchart* *Write a linear search for a single record in a two-dimensional list (code)*	*1.1.1* *1.2.1* *1.2.6* *6.2.2*
Y10-04	*CT24*	*Assessment*	*Use one-dimensional and two-dimensional lists* *Find a single item in a one-dimensional list* *Find a single record and file in a two-dimensional list*	*6.2.2* *6.3.1* *6.3.3* *6.4.1* *6.4.3* *6.6.2*
Y10-04	*P19*	*Operating systems*	*Describe the role of the operating system in a computer system* *Identify tasks carried out by an OS*	*3.2.1*
Y10-04	*P20*	*OS: file management*	*Describe how the OS organises files and allocates space on a hard drive* *Construct an expression to calculate the number of blocks of space on a hard drive needed to store a file of a given size* *Describe how file permissions are used to control access to files* *Select an appropriate level of file access (read, write, delete, none) for a user*	*3.2.1*
Y10-04	*P21*	*OS: process management*	*Describe how an OS uses scheduling to give each active process a share of CPU time* *Describe the features of the round-robin scheduling algorithm* *Describe how the OS uses a paging algorithm to swap programs in and out of main memory.*	*3.2.1*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-04	*P22*	*OS: peripherals & user management*	*Define what is meant by the term 'peripheral'* *Describe how the OS uses drivers to communicate with and manage peripherals* *Explain the purpose of a user interface and describe features of a user interface* *Define what is meant by the term 'access control'* *Describe commonly used methods of authentication* *Select suitable access right for specified individuals*	*3.2.1*
Y10-04	*P23*	*Utility software*	*Define what is meant by the term 'utility software'* *Identify different types of utility software* *Describe the purpose of:* *– file repair/recovery software* *– backup/recovery software* *– file compression software* *– disk defragmentation software* *Select which utility software tool to use for a particular task*	*3.2.2*
Y10-04	*P24*	*ASSESSMENT*	*Define what is meant by the term 'operating system'* *Describe how files are organised* *Select appropriate permissions for specified users* *Define what is meant by the term 'process'* *Describe how an OS allocates each active process a share of CPU time* *Explain the role of a device driver* *Describe features of a GUI user interface* *Select a utility tool for a specified job*	*3.2.1* *3.2.2*
Y10-05	*CT25*	*Merge sort*	*Describe the merge sort algorithm* *Merge two sorted lists (paper, code)*	*1.2.1* *1.2.6* *6.2.2*
Y10-05	*CT26*	*Reading files*	*Open files for reading* *Read lines from text files* *Close a file*	*6.2.2* *6.3.1* *6.4.2*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-05	*CT27*	*String processing*	*Split lines on commas* *Store items in lines as records in two-dimensional structure*	*1.2.2* *6.3.1* *6.3.3* *6.4.2*
Y10-05	*CT28*	*Writing files*	*Open files for writing* *Construct comma-separated value line from record in two-dimensional structure* *Write comma separated text (records) to a file* *Close a file*	*1.2.2* *6.3.1* *6.3.3* *6.4.2*
Y10-05	*CT29*	*Authentication*	*Define the term 'authentication'* *Create a flowchart for algorithm* *Implement authentication using a two-dimensional structure with at least two columns*	*1.2.1* *6.2.2* *6.3.1* *6.4.4*
Y10-05	*CT30*	*Assessment*	*Validate input* *Read and write files* *Iterate over all records in a two-dimensional structure*	*6.3.1* *6.4.2* *6.4.3*
Y10-05	*P25*	*Malware & anti-malware*	*Define what is meant by the term 'cyberattack'* *Describe the financial, reputational and legal damage that a cyberattack can cause* *Describe the characteristics of and threat posed by different types of malware* *Describe how anti-malware works* *Explain why it is important to keep anti-malware up-to-date*	*3.2.2* *4.2.1* *5.3.1* *5.3.2*
Y10-05	*P26*	*Hackers*	*Define what is meant by the term 'hacker'* *Explain why unpatched software is a target for hackers* *Explain the function of a firewall* *Explain how ethical hacking and penetration testing help identify vulnerabilities*	*4.2.1* *5.3.2*
Y10-05	*P27*	*Social engineering*	*Define what is meant by the term 'social engineering'* *Describe commonly used social engineering tactics (phishing, pretexting, baiting, quid pro quo) used by hackers* *Explain the purpose of an acceptable use policy and what it typically includes*	*5.3.1* *5.3.2*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-05	*P28*	*Data-level protection*	*Explain how data are protected by encryption* *Describe how backup and recovery procedures protect against data loss* *Explain how access control helps to protect systems and data*	*4.2.1* *5.3.2*
Y10-05	*P29*	*Robust software*	*Define what is meant by the term 'robust software'* *Explain how a hacker can exploit a code vulnerability* *Describe examples of bad coding practices and secure coding practices* *Explain how code reviews and audit trails help to identify vulnerabilities*	*3.2.3*
Y10-05	*P30*	*ASSESSMENT*	*Identify a type of malware* *Describe how anti-malware protects digital systems and data* *Explain how backup and recovery procedures would help an organisation withstand a ransomware attack* *Explain the security threat posed by unpatched software* *Describe the purpose of an acceptable use policy* *Describe two bad programming practices that could make software vulnerable to attack*	*3.2.3* *5.3.1* *5.3.2*
Y10-06	*CT31*	*Turtle introduction, pens and lines*	*Decompose a problem* *Use turtle graphics to draw lines*	*6.1.1* *6.1.2* *6.1.4*
Y10-06	*CT32*	*Turtle movement, coordinates, polygons, subprograms*	*Use Cartesian coordinates* *Incorporate selection, repetition, and iteration into turtle graphics* *Use subprograms*	*6.2.2* *6.3.1* *6.3.2* *6.4.1* *6.6.2*
Y10-06	*CT33*	*Turtle pens, colours, filling, and circle*	*Use turtle pens of different colours* *Use turtle pens of different sizes* *Use turtle fill in closed shapes*	*6.2.2* *6.3.1* *6.3.2* *6.6.1*

				6.6.2
Term	**Lesson number**	**Lesson title**	**What students will learn**	**Spec. ref.**
Y10-06	*CT34*	*Turtle, combining subprograms, layers*	*Combine subprograms to produce a turtle graphics image*	*6.2.2* *6.3.1* *6.3.2* *6.6.1* *6.6.2*
Y10-06	*CT35*	*Turtle big problem*	*Decompose a problem into smaller parts* *Combine subprograms to create a solution*	*1.1.1* *6.1.1* *6.1.2* *6.4.1* *6.6.1* *6.6.2*
Y10-06	*CT36*	*Assessment*	*Use the turtle module, programming constructs, and subprograms to create images*	*6.2.2* *6.3.1* *6.3.2* *6.6.1* *6.6.2*
Y10-06	*P31*	*LANs and WANs*	*Give reasons why computers are connected on a network* *Differentiate between a LAN and a WAN* *Categorise tasks according to the type of network used to carry them out* *Explain the benefits to organisations of a WAN* *Explain why protocols are needed on a network* *Describe the purpose of an IP address*	*4.1.1* *4.1.2* *4.1.3* *4.1.6*
Y10-06	*P32*	*Network speed*	*Define the meanings of the terms 'bandwidth' and 'latency'* *Explain how bandwidth and latency affect the performance of a network* *Use bits per second (bps) to describe network speed* *Construct expressions involving file size, transmission rate and time*	*2.3.1* *4.1.5*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y10-06	*P33*	*Connectivity*	*Differentiate between wired and wireless connectivity* *Explain how data are transmitted along copper and fibre-optic cables* *Compare the performance of copper and fibre-optic cables and give examples of their use* *Describe how high-speed broadband is delivered*	*4.1.4*
Y10-06	*P34*	*Wired vs wireless*	*Describe how devices are connected on a wireless network* *Compare the performance of wired and wireless LANs and give examples of situations where one is preferable to the other* *Summarise the characteristic of Wi-Fi, Bluetooth, RFiD, Zigbee and NFC and give examples of their use*	*4.1.4*
Y10-06	*P35*	*Network topologies*	*Define the term 'topology'* *Describes the characteristics of bus, star and mesh network topologies* *Draw and label a diagram of each topology* *Match descriptions to network topologies* *Match descriptions of what they do to internet components (backbone, POP, NAP, router)*	*4.1.3* *4.1.8*
Y10-06	*P36*	*ASSESSMENT*	*Give three reasons for connecting devices in a network* *Explain how a LAN differs from a WAN* *Define the term 'internet backbone'* *Describe the function of a router* *Explain how data are transmitted on a fibre-optic cable* *State two advantages and two disadvantages of using wireless to connect devices on a LAN rather than cable* *Construct an expression to calculate the time needed to transmit a file over a network* *Explain why protocols are needed on a network*	*4.1.1* *4.1.2* *4.1.3* *4.1.4* *4.1.5* *4.1.6*

Year 11

Term	Lesson number	Title	What students will learn	Spec. ref.
Y11-01	*CT1*	*Intro to programming*	*Use:* *– sequence in programs* *– if, elif, else in programs*	*6.2.2* *6.3.1* *6.3.2*

Term	Lesson number	Title	What students will learn	Spec. ref.
			– *repetition (while) in programs* – *iteration (one-dimensional) in programs*	*6.5.1* *6.5.2* *6.5.3*
Y11-01	*CT2*	*Subprograms*	*Define the terms:* – *'procedure'* – *'function'* – *'parameter'* – *'return value'* *Create:* – *procedures* – *functions* *Use:* – *'separation of concerns'*	*6.2.2* *6.3.1* *6.3.2* *6.5.1* *6.5.2* *6.5.3* *6.6.1* *6.6.2*
Y11-01	*CT3*	*Local, global*	*Define the terms:* – *'local variable'* – *'global variable'* *justify using either or both*	*6.1.5* *6.6.1* *6.6.2* *6.6.3*
Y11-01	*CT4*	*Maths, time*	*Be able to:* – *use math library methods* – *round real numbers to given decimal places*	*6.5.1* *6.6.1* *6.6.2*
Y11-01	*CT5*	*Problem solving*	*Write programs that take input and give output* *Use arithmetic operators* *Use maths library methods* *Use time library methods* *Format numeric output using round()*	*6.2.2* *6.3.1* *6.4.1* *6.5.1* *6.6.1*
Y11-01	*CT6*	*Assessment*	*Be able to:* *Use one-dimensional data structure* *Round real numbers* *Use mathematical methods* *Write subprograms using parameters* *Use string.format to create output*	*6.2.2* *6.3.1* *6.4.1* *6.5.1* *6.6.1* *6.6.2*
Y11-01	*P1*	*Embedded systems*	*Define what is meant by the term 'embedded system'* *Explain how an embedded system differs from a general-purpose computer* *Identify hardware and software components of embedded systems* *Describe applications of embedded systems*	*3.1.3*
Y11-	*P2*	*The Internet of*	*Define what is meant by the term 'Internet of*	*3.1.3*

Term	Lesson number	Title	What students will learn	Spec. ref.
01		*Things*	*Things' (IoT)* *Explain the role of embedded systems in the IoT* *Outline security and privacy issues associated with the IoT* *Explain why power is an important consideration for many IoT devices*	*4.1.1* *4.1.3*
Y11-01	*P3*	*Packet switching*	*Describe how packet switching is used to transmit data between devices on the internet* *Explain the purpose of an IP address.* *Describe the role of routers*	*4.1.3* *4.1.6* *4.1.7*
Y11-01	*P4*	*TCP/IP 1*	*Explain how the TCP/IP stack enables different types of devices attached to different networks to communicate with each other across the internet* *Put the layers of the stack in the correct order*	*4.1.3* *4.1.6* *4.1.7*
Y11-01	*P5*	*TCP/IP 2*	*Describe what each layer of the stack does* *List the protocols that operate in each layer* *Describe what each protocol does*	*4.1.6* *4.1.7*
Y11-01	*P6*	*ASSESSMENT*	*Identify the hardware components of an embedded systems* *Describe a task that could be performed by an embedded system* *State the purpose of a protocol* *List three pieces of information stored in a packet header* *Put the layers of the TCP/IP model in the correct order* *Describe two tasks performed by the transport layer* *Give two protocols used in the link layer*	*3.1.3* *4.1.6* *4.1.7* *4.1.8* *4.2.1* *5.3.1* *5.3.2*
Y11-02	*CT7*	*Trace tables*	*Determine the value of variables using trace tables*	*1.2.4*
Y11-02	*CT8*	*Errors*	*Predict output, give input* *Identify errors (runtime, syntax, logical)* *Fix errors (syntax, runtime, logical)*	*1.2.4* *1.2.5* *6.1.5* *6.1.6*
Y11-	*CT9*	*Bubble sort*	*Describe the characteristics of a bubble sort*	*1.2.6*

Term	Lesson number	Title	What students will learn	Spec. ref.
02			*Apply a bubble sort algorithm to a list of items (numbers and strings)* *Recognise, amend, and trace the code for a bubble sort*	*6.1.6*
Y11-02	*CT10*	*Binary search*	*Describe the characteristics of a binary search* *Apply a binary search algorithm to a list of items (numbers and strings)* *Recognise, amend, and trace the code for a binary search*	*1.2.6* *6.1.6* *6.6.1*
Y11-02	*CT11*	*Problem solving*	*Decompose a problem* *Read and write text files* *Use subprograms that take parameters and return results* *Write code in a high-level programming language*	*6.1.3* *6.2.2* *6.3.1* *6.4.2* *6.6.1*
Y11-02	*CT12*	*Assessment*	*Compare algorithm efficiency (number of passes, number of compares)* *Apply a bubble sort to a list* *Apply a binary search to a sorted list* *Trace an algorithm to determine state of variables* *Locate and fix logic errors in algorithm (paper)*	*1.2.4* *1.2.6* *1.2.7* *6.1.5* *6.1.6*
Y11-02	*P7*	*Environmental issues: manufacture & use*	*Describe the environmental impact of the manufacture of digital technology* *Describe ways in which the environmental impact can be reduced* *Describe how the energy consumed by digital devices harms the environment* *Describe how energy consumption can be reduced*	*5.1.1*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y11-02	*P8*	*Environmental issues: e-waste*	*Define what is meant by the term 'e-waste'* *Describe environmental issues associated with the disposal of digital technology* *Explain how responsible recycling can reduce the environmental impact of digital technology* *Explain how the short replacement cycle of mobile phones and other digital devices impacts on the environment*	*5.1.1*
Y11-02	*P9*	*Low-level & high-level languages*	*Define what is meant by the terms 'low-level language' and 'high-level language'* *Explain why each processor has its own unique instruction set* *Describe how writing a program in a low-level language differs from writing one in a high-level language* *Compare features of low-level and high-level languages and identify tasks for which each is best suited*	*3.3.1*
Y11-02	*P10*	*Translators*	*Explain the need for program translators* *Define what is meant by the terms 'compiler' and 'interpreter'* *Compare the way in which interpreters and compilers translate high-level code into machine code* *Describe the advantages/disadvantages of each approach* *Select and justify which method of translation to use for a given purpose*	*3.3.2*
Y11-02	*P11*	*Intellectual property*	*Define what is meant by the term 'intellectual property'* *Describe possible consequences of IP theft* *Explain how copyright, patents and trademarks help to protect IP* *Compare features of open source and proprietary software*	*5.2.3*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y11-02	*P12*	*ASSESSMENT*	*List two ways in which the manufacture of digital technology damages the environment* *Describe one way of reducing the amount of e-waste that is generated* *List two ways in which a high-level language differs from a low-level language* *Identify a task for which a low-level language would be used and one for which a high-level language would be more suitable* *State the purpose of a language translator* *Describe how an interpreter differs from a compiler* *Explain how a copyright differs from a patent* *Explain why a software developer may prefer to use open source software rather than proprietary software*	*3.3.1* *3.3.2* *5.1.1* *5.2.3*
Y11-03	*CT13*	*Data types, string manipulation, validation, testing with data*	*Use primitive data types* *Define the terms valid, erroneous, boundary (extreme) data* *Design data to test all three conditions* *Test code using test data*	*1.2.4* *6.1.6*
Y11-03	*CT14*	*Data structures (one-dimensional)*	*Understand the characteristics of one-dimensional data structures* *Choose appropriate use of one-dimensional data structures* *Reverse traverse a one-dimensional data structure* *Discuss efficiency considerations for one-dimensional structures*	*1.2.1* *1.2.2* *1.2.7* *6.1.6* *6.2.2* *6.3.1*
Y11-03	*CT15*	*Trace tables*	*Determine the value of variables using trace tables*	*1.2.4*
Y11-03	*CT16*	*Errors*	*Predict output, give input* *Locate errors (runtime, syntax, logical)* *Fix errors (syntax, runtime, logical)*	*1.2.4* *1.2.5* *6.1.5* *6.1.6*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y11-03	*CT17*	*Problem solving*	*Decompose problems* *Design subprogram interfaces* *Read and write files* *Use string manipulation methods* *Use one-dimensional data structures*	*1.1.1* *6.1.1* *6.1.2* *6.1.4* *6.2.2* *6.3.1* *6.3.2* *6.3.3* *6.4.2* *6.6.2*
Y11-03	*CT18*	*Assessment*	*Design test data to meet requirements* *Justify the use of data structure* *Use trace tables with nested constructs* *Use a reverse linear search on a sorted list efficiently* *Use a forward linear search on an unsorted list*	*1.2.2* *1.2.4* *1.2.6* *5.2.2* *6.3.1*
Y11-03	*P13*	*Bitmaps 1*	*Describe how bitmap images are represented in binary* *Define what is meant by the terms 'bitmap', 'pixel', 'resolution' and 'colour depth'* *Construct an expression to calculate the size of an image in pixels* *Differentiate between image size and image resolution* *Convert binary data into bitmap images and generate the binary data for bitmap images*	*2.1.1* *2.2.2* *2.2.4*
Y11-03	*P14*	*Bitmaps 2*	*Construct an expression to calculate the file size of an image (width x height x colour depth) and – given the file size and the values of any two of the variables – to calculate the value of the remaining one* *Explain how the number of available bits impacts on the accuracy of the representation and why there is always a trade-off between resolution and storage space/bandwidth.*	*2.1.1* *2.2.2* *2.2.4* *2.3.1*
Y11-03	*P15*	*Representation of sound*	*Differentiate between analogue and digital data* *Define what is meant by the terms 'amplitude', 'sample rate', 'bit depth' and 'sample interval'* *Describe the process of converting analogue sound into binary data.* *Identify factors that affect the accuracy of the digital representation.*	*2.2.3* *2.2.4* *2.3.1*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y11-03	*P16*	*Representation of sound*	*Draw and label a diagram illustrating ADC* *Explain why an analogue sound is never fully reproducible in binary* *Explain factors that affect the fidelity of the digital representation* *Construct an expression to calculate the file size of a sound (sample rate x bit depth x time)*	*2.1.1* *2.2.3* *2.2.4*
Y11-03	*P17*	*Compression*	*Give reasons for wanting to reduce file sizes (storage, streaming)* *Describe how compression affects file sizes* *Identify potential drawback of compressing files* *Explain the difference between lossless and lossy compression* *Describe the advantages/disadvantages of each*	*2.3.2*
Y11-03	*P18*	*ASSESSMENT*	*Describe how bitmap images are represented in binary* *Explain the difference between image size and image resolution* *Explain the limitations of binary representation of data (bitmaps)* *Construct an expression to calculate the file size of an image in kibibytes* *Describe how analogue sound is represented in binary* *Construct an. expression to calculate file sizes of sounds* *Explain the limitations of binary representation of data (sound)* *Explain the need for data compression* *Select the appropriate type of compression for a specified purpose*	*2.2.2* *2.2.3* *2.2.4* *2.3.1* *2.3.2*
Y11-04	*CT19*	*Data structures (two-dimensional)*	*Recall the characteristics of two-dimensional structures (record/entity/row, column/field, mixed types)* *Use indexing to locate records and fields in two-dimensional structure* *Traverse a two-dimensional structure* *Display a record/entity/row in columnar format*	*1.2.2* *6.2.2* *6.3.1* *6.4.1* *6.6.2*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y11-04	*CT20*	*Subprograms (local, global, procedures, functions)*	*Define the terms local and global in terms of variables* *Define the terms function, procedure, parameters, return value* *Decompose problems* *Write functions and procedures with/without parameters*	*6.1.6* *6.1.2* *6.2.1* *6.6.3*
Y11-04	*CT21*	*Problem solving*	*Decompose a problem* *Read a text file* *Build a two-dimensional data structure* *Search a two-dimensional data structure* *Use string.format() to make output fit for purpose*	*6.1.1* *6.1.2* *6.2.2* *6.3.1* *6.3.3* *6.6.2*
Y11-04	*CT22*	*Trace tables, errors, flowcharts*	*Create a flowchart given working code* *Use trace tables to determine state of variables* *Recognise the code for a bubble sort*	*1.2.1* *1.2.2* *1.2.5* *1.2.6*
Y11-04	*CT23*	*Problem solving, testing with data*	*Decompose a problem* *Create subprograms (procedures, functions) using parameters and return values* *Design and use test data (valid, erroneous, boundary)* *Use a linear search*	*6.1.2* *6.1.3* *6.1.4* *6.1.6* *6.2.2* *6.3.1* *6.6.1*
Y11-04	*CT24*	*Assessment*	*Use a trace table to find and fix errors* *Create code for a bubble sort* *Linear search two-dimensional structure* *Design and create test data* *Translate a flowchart to code*	*1.2.4* *1.2.5* *1.2.6* *6.1.3* *6.1.6* *6.2.2*
Y11-04	*P19*	*AI, machine learning & robotics*	*Define the meaning of the terms 'AI', 'machine learning' and 'robotics'* *Describe applications of these technologies* *Describe ethical issues associated with the use of these technologies* *Describe safety and accountability issues associated with the use of these technologies*	*5.2.2*

Term	Lesson number	Lesson title	What students will learn	Spec. ref.
Y11-04	*P20*	*AI, machine learning & robotics*	*Define the meaning of the term 'algorithmic bias* *Give examples of algorithmic bias* *Weigh-up the benefits and drawbacks of these technologies and recommend how they should be regulated*	*5.2.2*
Y11-04	*P21*	*Personal data*	*Define what is meant by the term 'digital footprint' and give examples of activities in which digital footprints (active or passive) are generated* *Explain how and why organisations collect personal data* *Describe benefits and drawbacks of sharing personal data with other people and organisations.*	*5.2.1*
Y11-04	*P22*	*Privacy*	*Describe privacy concerns associated with the collection and use of personal data* *Explain why it is difficult to attribute ownership of personal data to a specific individual* *Define the meaning of the terms 'identity theft' and 'data misuse'*	*5.2.1*
Y11-04	*P23*	*Data protection & computer misuse*	*Explain the rights of data subjects and the obligations of organisations laid down in the UK Data Protection Act* *Outline how the Computer Misuse Act deters criminals from stealing personal data* *Give examples of misuse of personal data*	*5.2.1*
Y11-04	*P24*	*ASSESSMENT*	*Explain one ethical concern associated with the use of social media* *Describe how legislation helps to protect personal data from misuse* *Explain what is meant by the 'right to be forgotten' can help to protect the privacy of an individual* *Explain how algorithmic bias can discriminate against some individuals* *Describe two ways in which the use of AI and machine learning impacts on employment* *Describe one potential societal benefit of the use of AI and machine learning*	*5.2.1* *5.2.2*

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