

Long-term planning

Computer Science - Year 11

Year 11	Autumn term 1	Autumn term 2	Spring term 1	Spring term 2	Summer term 1	Summer term 2
	Students will know that	Students will know that	Students will know that	Students will know that	Students will know that	Students will know that
	<p>Devices are connected to networks to support collaborative working and to enable rapid deployment of new software or updates.</p> <p>The method of addressing using four sets of digits held in 32 bits is called IPv4.</p> <p>IPv6 - has been introduced, significantly increasing the number of possible addresses to trillions. IPv6 addresses are held in 128 bits.</p> <p>When a web browser requests a webpage, it uses DNS to translate the website's domain name into an IP address.</p> <p>In packet switching, messages are broken up into very small pieces, called packets. Each packet consists of two parts: header (including the sender's and recipient's IP addresses, the packet number, the total number of packets the message contains, plus the details of any protocols used) and payload (part of the message itself).</p> <p>The principle high-speed data transmission routes between</p>	<p>Activities related to the manufacture of digital devices, such as mining operations, and component production damage the environment e.g. through water pollution and habitat destruction.</p> <p>Energy consumption is an environmental issue caused by the growing number of digital devices being used across the world.</p> <p>Data centres are believed to account for between 1-3% of global energy consumption.</p> <p>Fossil fuels are used to generate electricity to run data centres, leading to an increase in: Greenhouse gas emissions, Air pollution, Water pollution, Land degradation and Impact on wildlife.</p> <p>A replacement cycle is how often digital devices such as smartphones, computers, servers or machinery are replaced. Greater demand has meant shorter timeframes for devices leading to increased e-waste, more energy consumption and resource depletion.</p>	<p>Code readability refers to ensuring that white space, indentation, sensible use of comments and sensible variable/function/procedure names are used to ensure that code is readable by all.</p> <p>Good programming practice includes the layout of the solution effectively separating sections, such as putting all the variables together and all sub programs together as appropriate.</p> <p>Functionality of a program refers to whether a program is robust, responds predictably to input and the program parts are complete, fully meeting the requirements.</p>	<p>Output messages in python should be fit for audience and purpose, with attention paid to spelling and punctuation.</p> <p>.format</p> <p>A 2D array can be visualised as a table with rows and columns.</p> <p>When navigating through a 2D array you first must go down the rows and then across the columns to find a position within the array.</p> <p>Solution design is how well the solution has been produced in terms of has the problem been decomposed, are the selection of programming constructs appropriate and is the logic clear and appropriate to the problem.</p>	<p>Trace tables are used to determine the values of variables, index values and can be used by programmers to spot errors in programs.</p>	<p>XXXX</p>

interconnected networks is the internet backbone.

A wired network uses copper cable or fibre optic cable to form the connections between the networked devices (nodes). Fibre optic cables have a greater bandwidth so transfer speeds are faster. Wireless networks tend to use radio signals as their communication medium but could use other wireless methods such as infrared light.

Bandwidth, speed range and latency can be used to compare the performance of networks.

Network speeds are measured in bits per second. $\text{Time} = \text{file size (in bits)} / \text{network speed (bps)}$

A communication protocol is a set of rules governing data transmission between devices.

The TCP/IP model is a four-layer stack that specifies how data is exchanged over the internet.

HTTP, HTTPS, FTP, POP3, SMTP and IMAP are network protocols operating at the application layer of TCP/IP stack.

TCP/IP operates at the transport layer of the TCP/IP stack.

Personal data relates to an identified/identifiable individual and can be collected through cookies, location-based apps and social media posts.

The Data Protection Act (1998) exists to ensure that organisations in the UK comply with the law regarding data privacy.

General Data Protection Regulation (GDPR) is a European-wide law that tightens data privacy and gives data subjects extra rights, including things such as the right to be informed, the right of access and the right to object.

The Computer Misuse Act protects individuals personal data by deterring hackers from accessing it.

The digital divide refers to the division between people who are able to afford technology and those who cannot, along with people who have the skills to use technology and those that don't.

Artificial Intelligence is an umbrella term referring to computer systems able to perform tasks normally requiring human intelligence, such as speech recognition and decision making.

Robotics involves creating autonomous systems to

Data is split up into packets at the transport layer of the TCP/IP stack and in the packet header a numerical value for checksum is added.

Ethernet and Wi-Fi operate at the link layer of the TCP/IP stack.

A network topology describes the arrangement of devices in a network.

The characteristics of a topology affect its performance, scalability, reliability and security.

Network security is any activity designed to protect a network and its data from internal and external threats.

A network vulnerability is a weakness that can be exploited by a criminal to gain unauthorised access to information or resources.

The objective of access control is to keep unauthorised users and devices from gaining access to a network and restricts what authorised users can do.

Physical security measures can be put in place to protect a network such as locked doors to server rooms, key card entry and CCTV.

A firewall helps to protect a network by monitoring incoming and outgoing traffic and using a set of rules to

perform specific tasks without human intervention.

Machine learning involves training an algorithm to learn from its inputs without being specifically programmed to perform a task.

Intellectual property refers to the creations of the human intellect and copyright, patents and trademarks help protect them.

Licensing allows the creator of a software application to specify how it can be used and distributed.

Malware is malicious software intentionally designed to cause harm.

Hackers are criminals who exploit technical vulnerabilities to break into computer systems and networks and they use unpatched software and out-of-date anti-malware to launch cyberattacks.

Social engineering is manipulating people into handing over confidential information such as a PIN or password through shouldering and phishing.

Anti-malware has three purposes:

- to detect malware that has been installed
- to prevent malware from being installed

<p>determine which traffic to allow in and out.</p> <p>Validation is used to check that user input matches program requirements such as checking that an entered string has the minimum length required (length check) or presence check.</p> <p>A while loop that terminates only when a correct input is received is an effective way of validating user input.</p> <p>Authentication checks to see if a correct user input matches expected input by doing comparison checks.</p> <p>The math library is a library of code which allows users to make use of mathematical operations which can be performed with ease e.g. <code>math.pi</code>, <code>math.sqrt(x)</code>, <code>math.floor(x)</code>, <code>math.ceil(x)</code>.</p>	<ul style="list-style-type: none"> to remove malware from the system <p>Encryption is the process of encoding data or a message so that it cannot be understood by anyone other than its intended recipient.</p> <p>Unencrypted messages are referred to as plaintext messages. Encrypted messages are known as ciphertext.</p> <p>An acceptable use policy defines how the users of a system must act.</p> <p>Backup software will backup files on a network server at regular set intervals. This can be backups to other hard disks (RAID) or, increasingly, servers on the internet (cloud backup).</p> <p>Backups can be full backup where all files are backed up or an incremental backup where only files that have been changed are backed up.</p>				
<p>Students will know how</p>	<p>Students will know how</p>	<p>Students will know how</p>	<p>Students will know how</p>	<p>Students will know how</p>	<p>Students will know how</p>
<p>To use test data to identify run-time and logic errors, which if undetected, would prevent the code from functioning as expected.</p> <p>To describe the function performed by each layer of the TCP/IP model.</p> <p>To select the most appropriate topology for a given scenario.</p>	<p>To identify strategies that can be used to extend the life of devices.</p> <p>To explain ways of reducing the impact of digital devices on the environment.</p> <p>To work professionally in a Computer Science/IT setting.</p> <p>To avoid algorithmic bias in their own coding.</p>	<p>To answer exam style questions, with a focus around how to achieve maximum marks per question.</p> <p>To use logical reasoning to refine code correcting errors by adding or rearranging lines of code, selecting the correct line and improving readability.</p>	<p>To decompose a mark scheme, including how to self-assess their own work using a mark scheme.</p> <p>To understand the levels-based mark scheme for solution design, good programming practice and functionality.</p> <p>To evaluate an algorithm's fitness for purpose, by</p>	<p>To reflect on progress made in year 10 and 11.</p> <p>To identify gaps in their own knowledge to target revision to these areas.</p> <p>To apply revision strategies to Computer Science for both Paper 1 and Paper 2.</p> <p>To answer varying exam style coding questions 1-6.</p>	<p>XXXX</p>

<p>To protect against vulnerabilities e.g. strong passwords, the use of firewalls, patched software etc.</p> <p>To explain how internal (white box) and external (black box) penetration testing is used to identify vulnerabilities.</p> <p>To differentiate between ethical (white-hat) and criminal (black-hat) hackers and to explain how ethical hacking can be used to identify and fix vulnerabilities.</p> <p>To identify different ways of authenticating a user. E.g. multi-factor authentication, biometrics</p> <p>To complete validation checks such as length check, presence check, range check or pattern check.</p> <p>To complete authentication checks such as checking a correct username/password has been entered by comparing with values stored in a list.</p> <p>To use the math library to complete solutions to math problems.</p> <p>To format numerical output using round().</p> <p>To answer exam style coding questions 1-4.</p>	<p>To produce programs of their own that have some artificial intelligence embedded.</p> <p>To debate the ethics, accountability, liability and safety of the growing use of AI tools.</p> <p>To differentiate between open-source and proprietary software.</p> <p>To identify the different types of malware based on their characteristics.</p> <p>To answer varying exam style coding questions 1-5.</p>	<p>To answer varying exam style coding questions 1-6, focusing on maximising marks by using good programming practice and considering functionality of solutions.</p> <p>To translate a flowchart to code.</p> <p>To reflect on progress made in year 10 and 11.</p> <p>To identify gaps in their own knowledge to target revision to these areas.</p> <p>To apply revision strategies to Computer Science for both Paper 1 and Paper 2.</p>	<p>comparing the solution with the given problem.</p> <p>To use .format() to format strings, customising output e.g. into columns, with widths, alignment and data type considered.</p> <p>To recall the characteristics of two-dimensional structures (record/entity/row, column/field, mixed types).</p> <p>To use indexing to locate records and fields in two-dimensional structure.</p> <p>To apply a linear search to a two-dimensional list (in code).</p> <p>To answer varying exam style coding questions 1-6.</p> <p>To identify gaps in their own knowledge to target revision to these areas.</p> <p>To apply revision strategies to Computer Science for both Paper 1 and Paper 2.</p>	<p>To use a trace table to find and fix errors.</p> <p>To use string manipulation functions (index, left, right, upper, lower, isalpha, ..., etc.) using assistance from the PLS.</p>	
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Vocabulary and the concepts they link to	Vocabulary and the concepts they link to	Vocabulary and the concepts they link to	Vocabulary and the concepts they link to	Vocabulary and the concepts they link to	Vocabulary and the concepts they link to
Network, Local Area Network, Wide Area Network, Workstation, IP Address, Domain Name System (DNS), Packet Switching, Router, Wireless, Bandwidth, Latency, Transmission Rate, Kilobit, Megabit, Gigabit, Protocol, Hyper Text Transfer Protocol (HTTP), Hyper Text Transfer Protocol Secure (HTTPS), File Transfer Protocol(FTP), Post Office Protocol 3(POP3), Simple Mail Transfer Protocol (SMTP), Internet Message Access Protocol (IMAP), Transmission Control Protocol (TCP), Checksum, Topology, Bus Topology, Star Topology, Mesh Topology, Vulnerability, Penetration Testing, Ethical Hacking, Firewall, Validation, Presence Check, Authentication, Multi-Authentication, Biometrics	Manufacture, Energy Consumption, Replacement Cycle, Disposal, E-Waste, Ethical, Personal Data, Privacy, Data Protection, Consent, Artificial Intelligence, Machine Learning, Algorithmic Bias, Robotics, Accountability, Intellectual Property, Copyright, Patent, Trademark, Malware, Computer Virus, Worms, Trojan, Ransomware, Key Logger, Unpatched Software, Anti-Malware, Social Engineering, Phishing, Shouldering, Encryption, User Policies, Backup and Recovery, Incremental Backup	Readability, Indentation, Layout, Functionality, User Requirements	Output, Fitness for Purpose, Formatting, Alignment, Data Types, Record, Entity, Row, Column/field	Trace Tables, String Manipulation	XXXX
Assessment	Assessment	Assessment	Assessment	Assessment	Assessment
Networks Assessment Low stakes quizzes	Issues and Impacts Assessment Python Assessment Low stakes quizzes	Paper 1 Assessment Paper 2 Assessment Low stakes quizzes	Paper 1 Assessment Paper 2 Assessment Low stakes quizzes	Final GCSE examinations – Paper 1 and Paper 2 Low stakes quizzes	XXXX
Diversity & development of cultural capital	Diversity & development of cultural capital	Diversity & development of cultural capital	Diversity & development of cultural capital	Diversity & development of cultural capital	Diversity & development of cultural capital
Spiritual – use of imagination and creativity and reflective of their experiences Moral – Ethical hacking/penetration testing Social – class/group discussions	Spiritual – use of imagination and creativity and reflective of their experiences Social – class/group discussions Moral – Computer Misuse Act Moral – Computer Science professionalism in coding careers	Spiritual – use of imagination and creativity and reflective of their experiences Social – class/group discussions	Spiritual – use of imagination and creativity and reflective of their experiences Social – class/group discussions	Spiritual – use of imagination and creativity and reflective of their experiences Social – class/group discussions	XXXX

		<p>Moral - E-waste is often shipped abroad to countries with a lower standard of disposal</p> <p>Moral – What does your household do with old electronic devices that are no longer used?</p>				
	Cross-curricular opportunities and enrichment	Cross-curricular opportunities and enrichment	Cross-curricular opportunities and enrichment	Cross-curricular opportunities and enrichment	Cross-curricular opportunities and enrichment	Cross-curricular opportunities and enrichment
	<p>National Coding Week</p> <p>External visit to ADA for problem-solving activities</p>	<p>Festive coding challenges</p> <p>Business Studies – Ethical considerations for Businesses to take with regards to environmental/legal aspects of Computing.</p> <p>Business Studies – User policies/access controls</p>	<p>Safer Internet Day</p>	<p>National Careers Week</p> <p>Easter coding challenges</p>		<p>XXXX</p>