GCSE COMPUTER SCIENCE

You will take two exams, both are 90 minutes long.

IMPORTANT: Computer science will be one of the first exams in the June exam series so don't put off your revision!

14th May 2018 :
Paper 1 : Computer systems

- Systems Architecture
- Memory
- Storage
- Wired and wireless networks
- Network topologies, protocols and layers
- System security
- System software
- Ethical, legal, cultural and environmental concerns

17th May 2018
Paper 2:
Computational thinking, algorithms and programming

- Algorithms
- Programming techniques
- Producing robust programs
- Computational logic
- Translators and facilities of languages
- Data representation

This is a checklist of topics you need to know for your Computer Science exam.

Content of Computer systems	Tick here when you understand it.
Systems architecture:	
• the purpose of the CPU • Von Neumann architecture: - MAR (Memory Address Register) - MDR (Memory Data Register) - Program Counter - Accumulator • common CPU components and their function: - ALU (Arithmetic Logic Unit) - CU (Control Unit) - Cache • the function of the CPU as fetch and execute instructions stored in memory • how common characteristics of CPUs affect their performance: - clock speed - cache size - number of cores • embedded systems: - purpose of embedded systems - examples of embedded sytems	

Memory:	
• the difference between RAM and ROM • the purpose of ROM in a computer system • the purpose of RAM in a computer system • the need for virtual memory • flash memory	
Storage:	
• the need for secondary storage • data capacity and calculation of data capacity requirements • common types of storage: - optical - magnetic - solid state • suitable storage devices and storage media for a given application, and the advantages and disadvantages of these, using characteristics: - capacity - speed - portability - durability - reliability - cost	
Wired and wireless networks:	
• types of networks: - LAN (Local Area Network) - WAN (Wide Area Network) • factors that affect the performance of networks • the different roles of computers in a client-server and a peer-to-peer network • the hardware needed to connect stand-alone computers into a Local Area Network: - wireless access points - routers/switches - NIC (Network Interface Controller/Card) - transmission media • the internet as a worldwide collection of computer networks: - DNS (Domain Name Server) - hosting - the cloud • the concept of virtual networks	

Content of Computer systems	
Network topologies, protocols and layers:	
• star and mesh network topologies • Wifi: - frequency and channels - encryption • ethernet • the uses of IP addressing, MAC addressing, and protocols including: - TCP/IP (Transmission Control Protocol/Internet Protocol) - HTTP (Hyper Text Transfer Protocol) - HTTPS (Hyper Text Transfer Protocol Secure) - FTP (File Transfer Protocol) - POP (Post Office Protocol) - IMAP (Internet Message Access Protocol) - SMTP (Simple Mail Transfer Protocol) • the concept of layers • packet switching	
System security:	
• forms of attack • threats posed to networks: - malware - phishing - people as the 'weak point' in secure systems (social engineering) - brute force attacks - denial of service attacks - data interception and theft - the concept of SQL injection - poor network policy • identifying and preventing vulnerabilities: - penetration testing - network forensics - network policies - anti-malware software - firewalls - user access levels - passwords - encryption	

Systems software:	
• the purpose and functionality of systems software • operating systems: - user interface - memory management/multitasking - peripheral management and drivers - user management - file management • utility system software: - encryption software - defragmentation - data compression - the role and methods of backup: - full - incremental	
Ethical, legal, cultural and environmental concerns	
• how to investigate and discuss Computer Science technologies while considering: - ethical issues - legal issues - cultural issues - environmental issues - privacy issues • how key stakeholders are affected by technologies • environmental impact of Computer Science • cultural implications of Computer Science • open source vs proprietary software • legislation relevant to Computer Science: - The Data Protection Act 1998 - Computer Misuse Act 1990 - Copyright Designs and Patents Act 1988 - Creative Commons Licensing - Freedom of Information Act 2000	
Content of Computational thinking, algorithms and programming Algorithms: • computational thinking: - abstraction - decomposition - algorithmic thinking • standard searching algorithms: - binary search - linear search • standard sorting algorithms: - bubble sort - merge sort - insertion sort	

• how to produce algorithms using: - pseudocode - using flow diagrams • interpret, correct or complete algorithms Programming techniques: • the use of variables, constants, operators, inputs, outputs and assignments • the use of the three basic programming constructs used to control the flow of a program: - sequence - selection - iteration (count and condition controlled loops) • the use of basic string manipulation • the use of basic file handling operations: - open - read - write - close • the use of records to store data • the use of SQL to search for data • the use of arrays (or equivalent) when solving problems, including both one and two dimensional arrays • how to use sub programs (functions and procedures) to produce structured code • the use of data types: - integer - real - Boolean - character and string - casting • the common arithmetic operators • the common Boolean operators Producing robust programs: • defensive design considerations: - input sanitisation/validation - planning for contingencies - anticipating misuse - authentication • maintainability: - comments - indentation	

• the purpose of testing • types of testing: - iterative - final/terminal • how to identify syntax and logic errors • selecting and using suitable test data	
<u>Content of Computational thinking, algorithms and programming</u> Computational logic: • why data is represented in computer systems in binary form • simple logic diagrams using the operations AND, OR and NOT • truth tables • combining Boolean operators using AND, OR and NOT to two levels • applying logical operators in appropriate truth tables to solve problems • applying computing-related mathematics: + – / * - Exponentiation (^) - MOD - DIV Translators and facilities of languages: • characteristics and purpose of different levels of programming language, including low level languages • the purpose of translators • the characteristics of an assembler, a compiler and an interpreter • common tools and facilities available in an integrated development environment (IDE): - editors - error diagnostics - run-time environment - translators Data representation: Units • bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte, petabyte • how data needs to be converted into a binary format to be processed by a computer. Numbers • how to convert positive denary whole numbers (0–255) into 8 bit binary numbers and vice versa • how to add two 8 bit binary integers and explain overflow errors which may occur • binary shifts • how to convert positive denary whole numbers (0–255) into 2 digit hexadecimal numbers and vice versa • how to convert from binary to hexadecimal equivalents and vice versa	

• check digits. Characters • the use of binary codes to represent characters • the term ‘character-set’ • the relationship between the number of bits per character in a character set and the number of characters which can be represented (for example ASCII, extended ASCII and Unicode). Images • how an image is represented as a series of pixels represented in binary • metadata included in the file • the effect of colour depth and resolution on the size of an image file. Sound • how sound can be sampled and stored in digital form • how sampling intervals and other factors affect the size of a sound file and the quality of its playback: - sample size - bit rate - sampling frequency. Compression • need for compression • types of compression: - lossy - lossless	