

PERSONAL LEARNER CHECKLIST KS4

GCSE Computer Science





Parent Curriculum Information:

Computer Science



Subject: Computer Science

Subject Leader: Mr James Muldoon

Year Group: 11

Email address: j.muldoon@becketonline.co.uk

| What Specification (syllabus) is being taught? | OCR GCSE Computer Science (9-1) from 2015 |
|---|---|
| What are the key topics | Component 01 - Computer Systems |
| and themes? When will | Component 02 – Computational thinking, algorithms and Programming |
| they be taught? | Component 03 – Programming project |
| How will my son or daughter be assessed? When do these assessments take place? | Component 01 – 1 hour and half exam worth 50% May 2018 Component 02 – 1 hour and half exam worth 50% may 2018 |
| What can my son or | -Use their Computing revision guides and text books that they have been issued with from school to help structure their revision. - Make use of their classwork booklets and exam papers. - Use of the below websites. - <u>www.becketcomputing.com</u> |
| daughter do for revision | Select Year 11 Revision and then computer science. -Select KS4 computing for the Theory units covered in the specification. |
| at home? What | <u>http://www.teach-ict.com/</u> -Good Computer Science theory. Caution some of the content is for the new computer Science specification. |
| materials are provided | <u>http://www.bbc.co.uk/education/subjects/z34k7ty</u> -Excellent resources mapped directly to the OCR GCSE Computing Specification. |
| or available online? | <u>http://www.cambridgegcsecomputing.org/</u> -On the app store search for OCR Past Exam Papers good source of past papers. -On Android search for GCSE Computing Revision by Mr S Whorton. Good computing theory with questions. |

Component 01 – Computer Systems

| | Systems Architecture | | |
|---|--|--|--|
| 1 | The purpose of the CPU | | |
| 2 | Von Neumann architecture: MAR (Memory Address Register) , MDR (Memory Data Register) Program Counter , Accumulator | | |
| 3 | Common CPU components and their function: ALU (Arithmetic Logic Unit) , CU (Control Unit), Cache | | |
| 4 | The function of the CPU as fetch and execute instructions stored in memory | | |
| 5 | How common characteristics of CPUs affect their performance: clock speed , cache size, number of cores | | |
| 6 | Embedded systems: purpose of embedded systems , examples of embedded systems | | |

| Memory | | | |
|--------|---|--|--|
| 1 | The difference between RAM and ROM | | |
| 2 | The purpose of ROM in a computer system | | |
| 3 | The purpose of RAM in a computer system | | |
| 4 | The need for virtual memory | | |
| 5 | Flash memory | | |

| | Storage | | |
|---|---|--|--|
| 1 | The need for secondary storage | | |
| 2 | Data capacity and calculation of data capacity requirements | | |
| 3 | Common types of storage: optical , magnetic , solid state | | |
| 4 | 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 | | |
| 5 | The need for virtual memory | | |
| 6 | Cache memory | | |
| 7 | Flash memory | | |
| 8 | How changes in memory technologies are leading to innovative computer designs | | |

| | Wired and Wireless networks | | |
|---|--|--|--|
| 1 | Types of networks: LAN (Local Area Network), WAN (Wide Area Network) | | |
| 2 | Factors that affect the performance of networks | | |
| 3 | The different roles of computers in a client-server and a peer-to-peer network | | |
| 4 | 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 | | |
| 5 | The internet as a worldwide collection of computer networks: DNS (Domain Name Server) , Hosting, the cloud | | |
| 6 | The concept of virtual networks | | |

| | Network Topologies, Protocols and Layers | | |
|---|--|--|--|
| 1 | Star and mesh network topologies | | |
| 2 | Wifi: frequency and channels , encryption | | |
| 3 | Ethernet | | |
| 4 | 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) | | |
| 5 | The concept of layers | | |
| 6 | Packet switching | | |

| | Systems Security | | |
|---|---|--|--|
| 1 | Forms of attack | | |
| 2 | 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 | | |
| 3 | Identifying and preventing vulnerabilities: penetration testing, network forensics, network policies, anti-malware software, firewalls user access levels, passwords, encryption | | |

| | Systems Software | | |
|---|---|--|--|
| 1 | The purpose and functionality of systems software | | |
| 2 | Operating systems: user interface, memory management/multitasking peripheral management and drivers, user management, file management | | |
| 3 | Utility system software: encryption software, defragmentation, data compression | | |
| 4 | The role and methods of backup: full, incremental | | |

| | Ethical, Legal, Cultural and Environmental concerns | | |
|---|---|--|--|
| 1 | How to investigate and discuss Computer Science technologies while considering: ethical issues, legal issues, cultural issues, environmental issues, privacy issues | | |
| 2 | How key stakeholders are affected by technologies | | |
| 3 | Environmental impact of Computer Science | | |
| 4 | Cultural implications of Computer Science | | |
| 5 | Open source vs proprietary software | | |
| 6 | 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 | | |

Component 02 - Computational thinking, algorithms and Programming

| | Algorithms | | |
|---|--|--|--|
| 1 | Computational thinking: abstraction , decomposition , algorithmic thinking | | |
| 2 | Standard searching algorithms: binary search , linear search | | |
| 3 | Standard sorting algorithms: bubble sort , merge sort , insertion sort | | |
| 4 | How to produce algorithms using: pseudocode , using flow diagrams | | |
| 5 | Interpret, correct or complete algorithms | | |

| | Programming Techniques | | |
|----|--|--|--|
| 1 | The use of variables, constants, operators, inputs, outputs and assignments | | |
| 2 | The use of the three basic programming constructs used to control the flow of a program: sequence , selection iteration (count and condition controlled loops) | | |
| 3 | The use of basic string manipulation | | |
| 4 | The use of basic file handling operations: open , read write , close | | |
| 5 | The use of records to store data | | |
| 6 | The use of SQL to search for data | | |
| 7 | The use of arrays (or equivalent) when solving problems, including both one and two dimensional arrays | | |
| 8 | How to use sub programs (functions and procedures) to produce structured code | | |
| 9 | The use of data types: integer , real , boolean , character and string , casting | | |
| 10 | The common arithmetic operators | | |
| 11 | The common Boolean operators | | |

| | Producing robust programs | | |
|---|--|--|--|
| 1 | Defensive design considerations: input sanitisation/validation , planning for contingencies , anticipating misuse , authenticating | | |
| 2 | Maintainability: comments , indentation | | |
| 3 | The purpose of testing | | |
| 4 | Types of testing: iterative , final/terminal | | |
| 5 | How to identify syntax and logic errors | | |
| 6 | Selecting and using suitable test data | | |

| Computational Logic | | | |
|---------------------|--|--|--|
| 1 | Why data is represented in computer systems in binary form | | |
| 2 | Simple logic diagrams using the operations AND, OR and NOT | | |
| 3 | Truth tables | | |
| 4 | Combining Boolean operators using AND, OR and NOT to two levels | | |
| 5 | Applying logical operators in appropriate truth tables to solve problems | | |
| 6 | Applying computing-related mathematics: + , - , / , * , Exponentiation (^) , MOD , DIV | | |

| Translators and Facilities of the Language | | | |
|--|--|--|--|
| 1 | Characteristics and purpose of different levels of programming language, including low level languages | | |
| 2 | The purpose of translators | | |
| 3 | The characteristics of an assembler, a compiler and an interpreter | | |
| 4 | Common tools and facilities available in an integrated development environment (IDE): editors, error diagnostics, run-time environment, translators. | | |

| Data Representation | | | |
|---------------------|--|--|--|
| 1 | Unitsbit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte, petabyte | | |
| 2 | • how data needs to be converted into a binary format to be processed by a computer. | | |
| 3 | Numbers • how to convert positive denary whole numbers (0-255) into 8 bit binary numbers and vice versa | | |
| 4 | • how to add two 8 bit binary integers and explain overflow errors which may occur | | |
| 5 | • binary shifts | | |
| 6 | • how to convert positive denary whole numbers (0-255) into 2 digit hexadecimal numbers and vice versa | | |
| 7 | • how to convert from binary to hexadecimal equivalents and vice versa | | |
| 8 | check digits | | |
| 9 | Charactersthe use of binary codes to represent characters | | |
| 10 | • the term 'character-set' | | |
| 11 | • 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) | | |
| 12 | Imageshow an image is represented as a series of pixels represented in binary. | | |
| 13 | • metadata included in the file | | |
| 14 | • the effect of colour depth and resolution on the size of an image file | | |
| 15 | Sound how sound can be sampled and stored in digital form | | |
| 16 | • 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 | | |
| 17 | Compression | | |

| | need for compression | | |
|----|---|--|--|
| 18 | • types of compression: lossy, lossless | | |