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| **Paddington Academy Topic Overview**  **Subject: Computing**  **Exam Board: AQA** | | |
| **Topic** | **Sub-Topics** | **Textbook/Revision Guide Pages** |
| **Fundamentals of algorithms** | Understand and explain the term algorithm. | 1 |
| Understand and explain the term decomposition. | 1 |
| Use a systematic approach to problem solving and algorithm creation representing those algorithms using pseudo-code and flowcharts. | 1 |
| Explain simple algorithms in terms of their inputs, processing and outputs. | 2 |
| Determine the purpose of simple algorithms. | 2 |
| Explain simple algorithms in terms of their inputs, processing and outputs. | 2 |
| Determine the purpose of simple algorithms | 3 |
| Understand that more than one algorithm can be used to solve the same problem. | 3 |
| Compare the efficiency of algorithms explaining how some algorithms are more efficient than others in solving the same problem. | 3 |
| Understand and explain how the linear search algorithm works. | 4 |
| Understand and explain how the binary search algorithm works. | 4 |
| Compare and contrast linear and binary search algorithms. | 4 |
| Understand and explain how the merge sort algorithm works. | 5-6 |
| Understand and explain how the bubble sort algorithm works. | 5-6 |
| Compare and contrast merge sort and bubble sort algorithms. | 7 |
| **Programming** | Understand the concept of a data type. | 8 |
| Use, understand and know how the following  statement types can be combined in programs: variables, constants | 9 |
| Use definite and indefinite iteration, including indefinite iteration with the condition(s) at the start or the end of the iterative structure. | 10 |
| Use nested selection and nested iteration structures. | 11 |
| Be familiar with and be able to use: addition, subtraction, multiplication, division | 12 |
| Understand the concept of data structures. | 14 |
| Use arrays (or equivalent) in the design of solutions to simple problems. | 16 |
| Be able to obtain user input from the keyboard. | 17 |
| Be able to use random number generation. | 18 |
| Understand the concept of subroutines. | 20 |
| Explain the advantages of using subroutines in programs. | 21 |
| Describe the structured approach to programming. | 22 |
| Be able to write simple data validation routines | 24 |
| Know that there are different levels of  programming language: low-level and high-level | 24 |
| Understand the advantages and disadvantages of low-level language programming compared with high-level language programming. | 2425 |
| **Fundamentals of data representations** | Understand the following number bases: decimal (base 10), binary (base 2), hexadecimal (base 16) | 26 |
| Understand that computers use binary to represent all data and instructions. | 27 |
| Explain why hexadecimal is often used in computer science. | 28 |
| Understand how binary can be used to represent whole numbers. | 29 |
| Understand how hexadecimal can be used to represent whole numbers. | 30 |
| Be able to convert between number bases | 31 |
| Know that: a bit is the fundamental unit of information  And a byte is a group of 8 bits. | 33 |
| Know the names, symbols and corresponding values for the decimal prefixes: | 34 |
| Be able to add together up to three binary numbers | 37 |
| Be able to apply a binary shift to a binary number. | 39 |
| Describe situations where binary shifts can be used. | 39 |
| Understand what a character set is and be able to describe the following character encoding methods: ASCII and Unicode | 39 |
| Understand that character codes are commonly grouped and run in sequence within encoding tables. | 40 |
| Describe the purpose of Unicode and the advantages of Unicode over ASCII. Know that Unicode uses the same codes as ASCII up to 127. | 40 |
| Understand what a pixel is and be able to describe how pixels relate to an image and the way images are displayed. | 40 |
| Know that the size of a bitmap image in pixels (width x height) is known as the image resolution. | 41 |
| Describe how a bitmap represents an image using pixels and colour depth. | 41 |
| Describe using examples how the number of pixels and colour depth can affect the file size of a bitmap image. | 41 |
| Calculate bitmap image file sizes based on the number of pixels and colour depth. | 42 |
| Convert binary data into a black and white image. | 42 |
| Convert binary data into a black and white image. | 42 |
| Understand that sound is analogue and that it must be converted to a digital form for storage and processing in a computer. | 43 |
| Understand that sound waves are sampled to create the digital version of sound. | 43 |
| Describe the digital representation of sound in terms of: sampling rate and sample resolution | 43 |
| Calculate sound file sizes based on the sampling rate and the sample resolution. | 43 |
| Explain what data compression is. | 44 |
| Understand why data may be compressed and that there are different ways to compress data. | 44 |
| Explain how data can be compressed using Huffman coding. | 44 |
| Be able to interpret/create Huffman trees. | 45 |
| Be able to calculate the number of bits required to store a piece of data compressed using Huffman coding. | 45 |
| Explain how data can be compressed using run length encoding (RLE). | 45 |
| Represent data in RLE frequency/data pairs. | 45 |
| **Computer systems** | Define the terms hardware and software | 26 |
| Construct truth tables for the following logic gates: NOT, AND, OR | 26 |
| Construct truth tables for simple logic circuits. | 27 |
| Interpret the results of simple truth tables. | 27 |
| Create, modify and interpret simple logic circuit diagrams. | 49 |
| Explain what is meant by: system software and application software.  Give examples of both types of software. | 49 |
| Understand the need for, and functions of, operating systems (OS) and utility programs. | 50 |
| Understand that the OS handles management of the: processor(s), memory, I/O devices, applications, security. | 50 |
| Explain the Von Neumann architecture. | 51 |
| Explain the role and operation of main memory | 51 |
| Explain the effect of the following on the  performance of the CPU: clock speed, number of processor cores, cache size, cache type | 53 |
| Understand and explain the Fetch-Execute cycle. | 53 |
| Understand the differences between main memory and secondary storage. | 55 |
| Understand the differences between RAM and  ROM. | 55 |
| Understand why secondary storage is required. | 55 |
| Be aware of different types of secondary storage (solid state, optical and magnetic). | 55 |
| Explain the operation of solid state, optical and magnetic storage. | 56 |
| Discuss the advantages and disadvantages of solid state, optical and magnetic storage. | 56 |
| Explain the term 'cloud storage'. | 56 |
| **Fundamentals of computer networks** | Define what a computer network is. | 57 |
| Describe the main types of computer network | 57 |
| Understand that networks can be wired or wireless. | 58 |
| Discuss the benefits and risks of wireless networks as opposed to wired networks. | 58 |
| Explain the following common network  topologies: star, bus | 59 |
| Define the term ‘network protocol’. | 59 |
| Explain the purpose and use of common  network protocols | 50 |
| Understand the need for, and importance of, network security. | 62 |
| Understand that the HTTP, HTTPS, SMTP, IMAP and FTP protocols operate at the application layer. | 62 |
| Understand that the TCP and UDP protocols operate at the transport layer. | 65 |
| **Fundamentals of cyber security** | Be able to define the term cyber security and be able to describe the main purposes of cyber security. | 62 |
| Understand and be able to explain the following cyber security threats: social engineering techniques, malicious code, weak and default passwords, misconfigured access rights, removable media, unpatched and/or outdated software. | 62 |
| Explain what penetration testing is and what it is used for. | 62 |
| Define the term social engineering | 62 |
| Explain the following forms of social  engineering: blagging (pretexting), phishing, pharming, shouldering | 62 |
| Define the term 'malware' | 62 |
| Describe what malware is and how it can be protected against. | 62 |
| Describe the following forms of malware: computer virus, Trojan, spyware, adware | 62 |
| Understand and be able to explain security measures | 62 |
| **Ethical, legal and environmental impacts of digital technology on wider society, including issues in privacy** | Explain the current ethical, legal and environmental impacts and risks of digital technology on society. Where data privacy issues arise these should be considered. | 66-74 |
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