Belfairs Academy

Computing Year 11 Fundamentals

Knowledge	Skills
Systems Architecture	Aware of: • The purpose of the CPU • Von Neumann Architecture • Common CPU components and their function • The function of the CPU as fetch, decode, execute • How common characteristics of CPUs affect their perfomance • Embedded Systems
Memory	• Difference between RAM and ROM • Purpose of ROM • Purpose of RAM • Need for Virtual Memory • Flash Memory
Storage	• The need for secondary storage • Data Capacity and calculation of requirements • Suitable storage devices for a given application and the advantages and disadvantages of them.
Wired and Wireless Networks	• Types of networks • Factors affecting the performance of networks • Role of computers in client-server and peer-to-peer networks • Hardware needed to connect standalone computers into Local Area Networks • The Internet as a global collection of computer networks • Virtual Networks
Network Topologies, Protocols and Layers	• Star and Mesh topologies • WiFi and Uses of IP and MAC addresses and protocols • The concept of layers • Packet switching vs circuit switching
System Security	• Forms of attack • Threats to networks • Identifying and preventing vulnerabilities
Systems Software	• Purpose and functionality of systems software • Operating Systens • Utility Systems Software
Ethical,Legal,cultural and environmental concerns	• Ethical and Legal issues • Cultural and 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 • Legal Acts and Creative Commons
Algorithms	Aware of:

	• Computational Thinking (Abstraction, decomposition, pattern recognition and algorithmic thinking) • Standard Searching Algorithms (linear and binary search) • Standard Sorting Algorithms (bubble, merge and insertion) • Pseudocode • Flow Charts • Interpretation of Algorithms
Programming Techniques	• Use of variable constants, operators, inputs, outputs and assignments • Use of sequence, selection and iteration in the program • Use of basic string manipulation • Use of basic file handling operations (open, read, write & close) • Using records to store data • SQL to search for data • Use of Lists (1D & 2D) when solving problems • Structuring code using function and procedures • Use of data types and casting • Common arithmetic and Boolean operators
Producing Robust Programs	• Defensive design considerations (input sanitisation, validation, planning for contingencies, anticipating misuse, authentication) • Maintainability (comments and indentation) • Purpose of iterative testing • Purpose of final testing • Identifying syntax and logic errors • Selecting and using suitable test data
Computational Logic	• Why data is represented in computer systems in binary form • Logic Diagrams using AND, OR & NOT • Combining Boolean operators using AND, OR and NOT • Applying logical operators in appropriate truth tables to solve problems • Applying computing-related mathematics (arithmetic, exponentiation MOD & DIV)
Translators and Facilities of Languages	• Characteristics and purpose of different level languages including low level languages • The purpose of translators • The characteristics of an assembler, compiler, and interpreter • Common tools and facilities available in integrated development environments (IDEs) (editors, error diagnostics, run time environment & translators)
Data Representation	• Bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte, petabyte. • Converting to binary format to be processed by a computer

	• Convert positive denary whole numbers (0-255) to 8-bit binary and vice-versa • Add two 8-bit integers and explain overflow errors which may occur • Binary shifts • Convert positive denary whole numbers (0-255) to 2 digit hexadecimal numbers and vice-versa • How to convert from binary to hexadecimal and vice-versa • Check digits • Using binary codes to represent characters • Define the term 'character set' • Explain the relationship between the number of bits per character in a character set and the number of characters which can be represented (eg ASCII, extended ASCII and Unicode) • Explain how an image is represented as a series of pixels represented in binary • Explain how meta data is included in a file • Explain how colour depth and resolution affect file size for an image • Explain how sound can be sampled and stored in digital form • Explain 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) • Explain the need for compression • Define and explain the difference between lossy and lossless compression