1.1 The characteristics of contemporary processors, input, output and storage devices Components of a computer and their uses		C&D	Isaac	Textbook
1.1.1 Structure and function of the processor				
	(a) The Arithmetic and Logic Unit; ALU, Control Unit and	Open	Open	
	• Registers (Program Counter; PC, Accumulator; ACC, Memory Address Register; MAR, Memory Data Register; MDR, C	Open	Open	
	• Buses: data, address and control: how this relates to assembly language programs	Open	Open	
	(b) The Fetch-Decode-Execute Cycle; including its effects on registers.	Open	Open	
	(c) The factors affecting the performance of the CPU: clock speed, number of cores, cache.	Open	Open	
	(d) The use of pipelining in a processor to improve efficiency	Open	Open	
	(e) Von Neumann, Harvard and contemporary processor architecture	Open	Open	
1.1.2 Types of processor				
	(a) The differences between and uses of CISC and RISC processors.	Open	Open	
	(b) GPUs and their uses (including those not related to graphics).	Open	Open	
	(c) Multicore and Parallel systems	Open	Open	
1.1.3 Input, output and storage				
	(a) How different devices can be applied to the solution of different problems.			
	• Input devices	Open	Open	
	• Output devices	Open	Open	
	• Storage	Open	Open	
	(b) The uses of magnetic, flash and optical storage devices.	Open	Open	
	(c) RAM and ROM	Open	Open	
	(d) Virtual Storage	Open	Open	

1.2 Software and software development Types of software and the different methodologies used to develop software		C&D	Isaac	Textbook
1.2.1 Systems Software				
	(a) The need for, function and purpose of operating systems.	Open	Open	
	(b) Memory Management (paging, segmentation and virtual memory).	Open	Open	
	(c) Interrupts, the role of interrupts and Interrupt Service Routines (ISR), role within the Fetch-Decode-Execute Cycle.	Open	Open	
	(d) Scheduling: round robin, first come first served, multi-level feedback queues, shortest job first and shortest remaining tim	Open	Open	
	(e) Distributed, embedded, multi-tasking, multi-user and real time operating systems.	Open	Open	
	(f) BIOS	Open	Open	
	(g) Device drivers	Open	Open	

	(h) Virtual machines, any instance where software is used to take on the function of a machine, including executing interme	Open	Open	
1.2.2 Applications Generation				
	(a) The nature of applications, justifying suitable applications for a specific purpose.	Open	Open	
	(b) Utilities.	Open	Open	
	(c) Open source vs closed source	Open	Open	
	(d) Translators:Interpreters, compilers and assemblers	Open	Open	
	(e) Stages of compilation (lexical analysis, syntax analysis, code generation and optimisation).	Open	Open	
	(f) Linkers and loaders and use of libraries.	Open	Open	
1.2.3 Software Development				
	(a) Understand the waterfall lifecycle, agile methodologies, extreme programming, the spiral model and rapid application de	Open	Open	
	(b) The relative merits and drawbacks of different methodologies and when they might be used.	Open	Open	
	(c) Writing and following algorithms.	Open	Open	
1.2.4 Types of Programming Language				
	(a) Need for and characteristics of a variety of programming paradigms.	Open	Open	
	(b) Procedural languages.	Open	Open	
	(c) Assembly language (including following and writing simple programs with the Little Man Computer instruction set). See ap	Open	Open	
	(d) Modes of addressing memory (immediate, direct, indirect and indexed)	Open	Open	
	(e) Object-oriented languages (see appendix 5d for pseudocode style) with an understanding of classes, objects, methods, attributes	Open	Open	

1.3 Exchanging data **How data is exchanged between different systems**		**C&D**	**Isaac**	**Textbook**
1.3.1 Compression, Encryption and Hashing				
	(a) Lossy vs Lossless compression.	Open	Open	
	(b) Run length encoding and dictionary coding for lossless compression.	Open	Open	
	(c) Symmetric and asymmetric encryption.	Open	Open	
	(d) Different uses of hashing.	Open	Open	
1.3.2 Databases				
	(a) Relational database, flat file, primary key, foreign key, secondary key, entity relationship modelling, normalisation and inc	Open	Open	
	(b) Methods of capturing, selecting, managing and exchanging data.	Open	Open	
	(c) Normalisation to 3NF	Open	Open	
	(d) SQL – Interpret and modify. See appendix 5d.	Open	Open	
	(e) Referential integrity.	Open	Open	
	(f) Transaction processing, ACID (Atomicity, Consistency, Isolation, Durability), record locking and redundancy.	Open	Open	

1.3.3 Networks				
	(a) Characteristics of networks and the importance of protocols and standards.	Open	Open	
	(b) The internet structure:			
	• The TCP/IP Stack.	Open	Open	
	• DNS.	Open	Open	
	• Protocol layering.	Open	Open	
	• LANs and WANs.	Open	Open	
	• Packet and circuit switching.	Open	Open	
	(c) Network security and threats, use of firewalls, proxies and encryption.	Open	Open	
	(d) Network hardware.	Open	Open	
	(e) Client-server and peer to peer.	Open	Open	
1.3.4 Web Technologies				
	(a) HTML. See appendix 5d.	Open	Open	
	(b) CSS. See appendix 5d.		Open	
	(c) JavaScript. See appendix 5d.		Open	
	(b) Search engine indexing	Open	Open	
	(c) PageRank algorithm.	Open	Open	
	(d) Server and client side processing.	Open	Open	

1.4 Data types, data structures and algorithms **How data is represented and stored within different structures. Different algorithms that can be applied to these structures**		**C&D**	**Isaac**	**Textbook**
1.4.1 Data Types				
	(a) Primitive data types, integer, real/floating point, character, string and Boolean	Open	Open	
	(b) Represent positive integers in binary.	Open	Open	
	(c) Use of sign and magnitude and two's complement to represent negative numbers in binary.	Open	Open	
	(d) Addition of binary integers.	Open	Open	
	(d) Subtraction of binary integers	Open	Open	
	(e) Represent positive integers in hexadecimal.	Open	Open	
	(f) Convert positive integers between binary hexadecimal and denary	Open	Open	
	(g) Representation and normalisation of floating point numbers in binary.	Open	Open	
	(h) Floating point arithmetic, positive and negative numbers - addition	Open	Open	
	(h) Floating point arithmetic, positive and negative numbers - subtraction	Open	Open	
	(i) Bitwise manipulation and masks: shifts, combining with AND, OR, and XOR.	Open	Open	

	(j) How character sets (ASCII and UNICODE) are used to represent text.	Open	Open	
1.4.2 Data Structures				
	(a) Arrays (of up to 3 dimensions), records, lists, tuples.	Open	Open	
	(b) The following structures to store data:			
	• Linked-list	Open	Open	
	• graph (directed and undirected)	Open	Open	
	• stack	Open	Open	
	• queue	Open	Open	
	• tree	Open	Open	
	• binary search tree	Open	Open	
	• hash table	Open	Open	
	(c) How to create, traverse, add data to and remove data from the data structures mentioned above. (NB this can be either using a	Open	^	
1.4.3 Boolean Algebra				
	(a) Define problems using Boolean logic. See appendix 5d.	Open	Open	
	(b) Manipulate Boolean expressions, including the use of Karnaugh maps to simplify Boolean expressions.	Open	Open	
	(c) Use the following rules to derive or simplify statements in Boolean algebra: De Morgan's Laws, distribution, association, c	Open	Open	
	(d) Using logic gate diagrams and truth tables. See appendix 5d	Open	Open	
	(e) The logic associated with D type flip flops, half and full adders.	Open	Open	

1.5 Legal, moral, cultural and ethical issues **The individual moral, social, ethical and cultural opportunities and risks of digital technology.** **Legislation surrounding the use of computers and ethical issues that can or may in the future arise from the use of computers**		**C&D**	**Isaac**	**Textbook**
1.5.1 Computing related legislation				
	(a) The Data Protection Act 1998.	Open	Open	
	(b) The Computer Misuse Act 1990.	Open	Open	
	(c) The Copyright Design and Patents Act 1988	Open	Open	
	(d) The Regulation of Investigatory Powers Act 2000	Open	Open	
1.5.2 Moral and ethical Issues				
	The individual moral, social, ethical and cultural opportunities and risks of digital technology:			
	• Computers in the workforce	Open	Open	
	• Automated decision making.	Open		
	• Artificial intelligence.	Open	Open	
	• Environmental effects.	Open	Open	

	• Censorship and the Internet	Open		
	• Monitor behaviour	Open	Open	
	• Analyse personal information	Open	Open	
	• Piracy	Open	Open	
	• Offensive communications	Open	Open	
	• Layout, colour paradigms and character sets.	Open	Open	