

Computer Science

Paper 1 - Computer Systems - Written Paper

Paper 2 - Computational thinking, algorithms and programming - Written Paper

What will be tested in the exams	RAG rate topic area	Revised for PPE's	Recover topic?
Architecture of the CPU			
The purpose of the CPU:			
The fetch-execute cycle			
Common CPU components and their function:			
ALU (Arithmetic Logic Unit)			
CU (Control Unit)			
Cache			
Registers			
Von Neumann architecture:			
MAR (Memory Address Register)			
MDR (Memory Data Register)			
Program Counter			
Accumulator			
CPU performance			
How common characteristics of CPUs affect their performance:			
Clock speed			
Clock speed			
Number of cores			
Embedded systems			
The purpose and characteristics of embedded systems			
Examples of embedded systems.			
Memory and storage			
How common characteristics of CPUs affect their performance:			
Primary Storage (Memory)			
The need for primary storage			
The difference between RAM and ROM			
The purpose of ROM in a computer system			
The purpose of RAM in a computer system			

Virtual memory			
Secondary Storage			
The need for secondary storage			
Common types of storage: Optical Magnetic Solid State			
Suitable storage devices and storage media for a given application			
The advantages and disadvantages of different storage devices and storage media relating to these characteristics:			
Capacity			
Speed			
Portability			
Durability			
Reliability			
Cost			
Units			
<i>The units of data storage:</i> • Bit • Nibble (4 bits) • Byte (8 bits) • Kilobyte (1,000 bytes or 1 KB) • Megabyte (1,000 KB) • Gigabyte (1,000 MB) • Terabyte (1,000 GB) • Petabyte (1,000 TB)			
<i>How data needs to be converted into a binary format to be processed by a computer</i>			
Data capacity and calculation of data capacity requirements			
Data Storage			
Numbers • How to convert positive denary whole numbers to binary numbers (up to and including 8 bits) and vice versa			

How to add two binary integers together (up to and including 8 bits) and explain overflow errors which may occur			
How to add two binary integers together (up to and including 8 bits) and explain overflow errors which may occur			
- How to convert binary integers to their hexadecimal equivalents and vice versa - Binary Shifts			
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, e.g.: - ASCII - Unicode			
Images			
How an image is represented as a series of pixels, represented in binary			
“ Metadata ”			
- The effect of colour depth and resolution on: - The quality of the image - The size of an image file			
Sound			
How sound can be sampled and stored in digital form			
- The effect of sample rate, duration and bit depth on: - The playback quality - The size of a sound file			
Compression			
The need for compression			
Types of compression			

○ Lossy ○ Lossless			
Computer networks, connections and protocols			
Types of network: • 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 • Web servers and clients			
Star and Mesh network topologies			
Wired and wireless networks, protocols and layers			
Modes of connection: • Wired • Ethernet • Wireless • Wi-Fi • Bluetooth			
Encryption			
IP addressing and MAC addressing			
Standards			
Common 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			
Network security			
Threats to computer systems and networks			
Forms of attack: • Malware • Social engineering, e.g. phishing, people as the 'weak point' • Brute-force attacks • Denial of service attacks • Data interception and theft • The concept of SQL injection			
Identifying and preventing vulnerabilities			
Common prevention methods: • Penetration testing • Anti-malware software • Firewalls • User access levels • Passwords • Encryption • Physical security			
Operating systems			
The purpose and functionality of operating systems: • User interface • Memory management and multitasking • Peripheral management and drivers • User management • File management			
Utility Software			
The purpose and functionality of utility software			
Utility system software: • Encryption software			

• Defragmentation • Data compression			
Ethical, legal, cultural and environmental impacts of digital technology			
Impacts of digital technology on wider society including: • Ethical issues • Legal issues • Cultural issues • Environmental issues • Privacy issues			
Legislation relevant to Computer Science: • The Data Protection Act 2018 • Computer Misuse Act 1990 • Copyright Designs and Patents Act 1988 • Software licences (i.e. open source and proprietary)			

Paper 2

What will be tested in the exams	RAG rate topic area	Revised for PPE's	Recover topic?
Algorithms			
Principles of computational thinking: • Abstraction • Decomposition • Algorithmic thinking			
Designing, creating and refining algorithms			
Identify the inputs, processes, and outputs for a problem			
Structure diagrams			
Create, interpret, correct, complete, and refine algorithms using: • Pseudocode • Flowcharts • Reference language/high-level programming language			
Identify common errors			
Trace tables			
Searching and sorting algorithms			
Standard searching algorithms:			

• Binary search • Linear search			
Standard sorting algorithms: • Bubble sort • Merge sort • Insertion sort			
Programming fundamentals			
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 common arithmetic operators			
The common Boolean operators AND, OR and NOT			
Data Types			
The use of data types: • Integer • Real • Boolean • Character and string • Casting			
Additional programming techniques			
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-dimensional (1D) and two-dimensional arrays (2D)			
How to use sub programs (functions and procedures) to produce structured code			
Random number generation			
Producing robust programs			

Defensive design considerations: • Anticipating misuse • Authentication			
Input validation			
Maintainability: • Use of sub programs • Naming conventions • Indentation • Commenting			
Testing			
The purpose of testing			
The purpose of testing Types of testing: • Iterative • Final/terminal			
Identify Syntax and logic errors.			
Selecting and using suitable test data: • Normal • Boundary • Invalid/Erroneous			
Refining algorithms			
Boolean logic			
Simple logic diagrams using the operators AND, OR and NOT			
Truth tables			
Combining Boolean operators using AND, OR and NOT			
Applying logical operators in truth tables to solve problems			
Languages			
Characteristics and purpose of different levels of programming language: • High-level languages • Low-level languages			
The purpose of translators			
The characteristics of a compiler and an interpreter			
The Integrated Development Environment (IDE)			
Common tools and facilities available in an Integrated Development Environment (IDE): • Editors • Error diagnostics			

• Run-time environment • Translators			
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