



Continue your lifelong love of learning and personal development

## Paper 1: Computer Systems Paper 2: Computational Thinking, Algorithms and Programming Both Papers 50% each and 1hr 30mins long

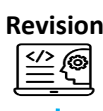
- ### Computer Science Careers
- Software Developer
  - Web Developer
  - Mobile App Developer
  - IT Manager
  - Information Security
  - Systems Architect
  - AI Engineer
  - Video Game Developer



Exam Time!



Mock Exams



Revision



Practical Programming Skills

- ### 2.3.2 Testing
- The purpose of testing
  - Types of testing: *Iterative, Final/Terminal*
  - Identifying syntax and logic errors
  - Selecting and using suitable test data: *Normal, Boundary, Invalid, Erroneous*
  - Refining Algorithms

- ### 2.3.1 Defensive Design
- Defensive design consideration: *Anticipating misuse & authentication*
  - Input validation
  - Maintainability: *Use of sub programs, naming convention, indentation, commenting*



Assessment

- ### 2.2.3 Additional Programming
- String Manipulation
  - File Handling
  - SQL
  - Arrays
  - Sub Programs

2.2.2 Data Types

- The use of data types: *Integer, Real, Boolean, Char & String, Casting*



MOCK EXAM

- ### 2.1.3 Searching and Sorting Algorithms
- Standard Searching Algorithms: *Binary & Linear*
  - Standard Sorting Algorithms: *Bubble, Merge & Insertion*



Revision



- ### 2.5.1 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

- ### 2.5.2 The IDE
- Common tools and facilities available in an Integrated Development Environment: *Editors, Error Diagnostics, Run-time Environment, Translators*

- ### 2.2.1 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*
  - The common arithmetic operators
  - The common Boolean operators AND, OR, NOT

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### 2.1.2 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 and high-level programming language*
- Identify common errors
- Trace tables



- ### 1.4.1 Threats to Computer Systems and Networks
- Forms of Attack: *Malware, Social Engineering, Brute-Force attacks, Denial of Service attacks, Data interception and theft, the concept of SQL injection*

- ### 1.4.2 Identifying and preventing vulnerabilities
- Common prevention methods: *Penetration testing, Anti-Malware software, Firewalls, User access levels, Passwords, Encryption, Physical Security*



- ### 1.3.2 Wired and Wireless Networks, Protocols and Layers
- Modes of connection: *Wired & Wireless*
  - Encryption
  - IP Addressing and MAC addressing
  - Common protocols: *TCP/IP, HTTP, HTTPS, FTP, POP, IMAP, SMTP*
  - The concept of layers

- ### 1.6.1 Ethical, Legal, Cultural and Environmental Impact
- 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 (Open Source and Proprietary)*



Assessment

- ### 1.5.2 Utility Software
- The purpose and functionality of utility software.
  - Utility system software: *Encryption software, Defragmentation, data compression*

- ### 1.5.1 Operating Systems
- The purpose and functionality of operating systems: *User Interface, memory management and multitasking, peripheral management and drivers, user management, file management*



- ### 1.3.1 Networks and Topologies
- 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 peer-to-peer network
  - The hardware needed to connect stand-alone computers into a Local Area Network: *Wireless Access Points, Routers, Switches, NIC, 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



- ### 1.2.4 Sound
- How sound can be sampled and stored in digital form
  - The effect of sample rate, duration and bit depth on the playback quality and the size of a sound file

### 1.2.1 Primary Storage (Memory)

- The need for Primary Storage
- The difference between RAM and ROM
- The purpose of RAM and ROM in a computer system
- Virtual Memory

### 1.2.2 Secondary Storage

- The need for secondary storage
- Common types of storage: *Optical, Magnetic and Solid State*
- Suitable storage devices and storage media for a given application
- The advantages and disadvantages of different storage devices and storage media relation to these characteristics: *capacity, speed, portability, durability, reliability, cost*



- ### 1.2.5 Compression
- The need for compression
  - Types of compression: *Lossy and Lossless*

- ### 1.1.3 Embedded Systems
- The purpose and characteristics of embedded systems
  - Examples of embedded systems

- ### 1.1.2 CPU Performance
- How common characteristics of CPUs affect their performance: *Clock Speed, Cache Size, Number of Cores*

- ### 1.1.1 Architecture of the CPU
- The purpose of the CPU and 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*



Assessment



- ### 1.2.4 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



# OCR

01100  
10110  
11110

# 10

How can 10 = 2?



- ### 2.4.1 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

- ### 1.2.3 Units
- The units of data storage: *Bit, Nibble, Byte, Kilobyte, Megabyte, Gigabyte, Terabyte, Petabyte*
  - How data needs to be converted into a Binary format to be processed by a computer
  - Data capacity and calculation of data capacity requirements

- ### 1.2.4 Data Storage - Numbers
- How to convert positive Denary whole numbers to Binary numbers and vice versa
  - How to add two Binary Integers together and explain overflow errors which may occur
  - How to convert positive Denary whole numbers into 2-digit Hexadecimal numbers and vice versa
  - How to convert Binary Integers to their hexadecimal equivalents and vice versa
  - Binary shifts

- ### 1.2.4 Characters
- The use of Binary codes to represent characters
  - The term 'character set'
  - The relationship between the number of bits per character and the number of characters which can be represented. e.g. *ASCII, Unicode*

0123456789  
ABCDEFGHIJKLM  
NOPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz