

Subject: A Level Computer Science

Exam Board: OCR

Paper Information: One paper covering the content taught during Year 12.

Paper Marks: 90 marks

Duration: 1 hour 45 minutes

Revision Checklist

Content:

1.1 The characteristics of contemporary processors, input, output and storage devices

1.1.1 Structure and function of the processor

- a) The Arithmetic and Logic Unit; ALU, Control Unit and Registers (Program Counter; PC, Accumulator; ACC, Memory Address Register; MAR, Memory Data Register; MDR, Current Instruction Register; CIR). Buses: data, address and control: how this relates to assembly language programs.
- b) The Fetch-Decode-Execute Cycle; including its effects on registers.
- c) The factors affecting the performance of the CPU: clock speed, number of cores, cache.
- d) The use of pipelining in a processor to improve efficiency.
- e) Von Neumann, Harvard and contemporary processor architecture.

1.1.2 Types of processor

- (a) The differences between and uses of CISC and RISC processors.
- (b) GPUs and their uses (including those not related to graphics).
- (c) Multicore and Parallel systems.

1.1.3 Input, output and storage

- a) How different input, output and storage devices can be applied to the solution of different problems.
- b) The uses of magnetic, flash and optical storage devices.
- c) RAM and ROM.
- d) Virtual storage.

1.2 Software and software development

1.2.3 Software Development

- a) Understand the waterfall lifecycle, agile methodologies, extreme programming, the spiral model and rapid application development.
- b) The relative merits and drawbacks of different methodologies and when they might be used.
- c) Writing and following algorithms.

1.3 Exchanging data

1.3.1 Compression, Encryption and Hashing

- a) Lossy vs Lossless compression.
- b) Run length encoding and dictionary coding for lossless compression.

- c) Symmetric and asymmetric encryption.
- d) Different uses of hashing.

1.3.2 Databases

- a) Relational database, flat file, primary key, foreign key, secondary key, entity relationship modelling, normalisation and indexing.
- b) Methods of capturing, selecting, managing and exchanging data.
- c) Normalisation to 3NF.
- d) SQL – Interpret and modify.
- e) Referential integrity.
- f) Transaction processing, ACID (Atomicity, Consistency, Isolation, Durability), record locking and redundancy.

1.3.3 Networks

- a) Characteristics of networks and the importance of protocols and standards.
- b) The internet structure:
 - The TCP/IP Stack.
 - DNS
 - Protocol layering.
 - LANs and WANs.
 - Packet and circuit switching.
- c) Network security and threats, use of firewalls, proxies and encryption.
- d) Network hardware.
- e) Client-server and peer to peer.

1.3.4 Web Technologies

- a) HTML, CSS and JavaScript.
- b) Search engine indexing.
- c) PageRank algorithm.
- d) Server and client side processing.

2.1 Elements of computational thinking

2.1.1 Thinking abstractly

- a) The nature of abstraction.
- b) The need for abstraction.
- c) The differences between an abstraction and reality.
- d) Devise an abstract model for a variety of situations.

2.1.2 Thinking ahead

- a) Identify the inputs and outputs for a given situation.
- b) Determine the preconditions for devising a solution to a problem.
- c) The nature, benefits and drawbacks of caching.
- d) The need for reusable program components.

2.1.4 Thinking logically

- a) Identify the points in a solution where a decision has to be taken.
- b) Determine the logical conditions that affect the outcome of a decision.
- c) Determine how decisions affect flow through a program.

2.2 Problem solving and programming

2.2.2 Computational methods

- a) Features that make a problem solvable by computational methods.
- b) Problem recognition.
- c) Problem decomposition.
- d) Use of divide and conquer.
- e) Use of abstraction.

Useful revision resources:

- Craig and Dave YouTube Channel
https://www.youtube.com/c/craigndave/playlists?view=50&sort=dd&shelf_id=4
- Teach ICT H446
https://teach-ict.com/2016/A_Level_Computing/OCR_H446/OCR_H446_home.html
- A Level OCR Computer Science course textbook by PG Online
- Isaac Computer Science
<https://isaacomputerscience.org>
- OneNote Classbook / Microsoft Teams
- Practice Papers on OneDrive
- Physics and Maths Tutor (Computer Science area)
<https://www.physicsandmathstutor.com/computer-science-revision/a-level-ocr>