



# Computer Science: GCSE to A-level transition

Topics to explore to prepare for A-level

# Introduction

The transition from GCSE to a A-level standard is significant. In A-level courses you will see an increasing emphasis on technical content, extended answers and independent research. With Computer Science being a very complex discipline, developing a detailed technical understanding is critical to success..

If you have studied GCSE Computer Science this will provide you with an excellent foundation on which to build; nevertheless, it is still important that you consolidate your knowledge and understanding of the GCSE material.

If you have not taken the subject at GCSE, do not worry, working through the material below will give you an excellent background on which to start in September.

This pack of work is designed to help you through the transition from GCSE to A-level Computer Science and you should find something here to support your preparation regardless of whether you have studied the GCSE course previously or the grade you gained at GCSE.

Some of this material is straightforward to complete, while other sections are more challenging. Do remember this is not a standalone “self-study” document. it contains questions and prompts to start you on your journey towards studying these topics in preparation for the A-level course.

## Contents

Introduction .....	1
Exam board and syllabus .....	3
The Topics .....	4
Systems Architecture .....	4
Memory.....	4
Storage devices .....	6
Networks.....	6
Wider computing issues and integrated questions .....	7
Online ISAAC Computing exercise .....	8
Recommended reading/viewing.....	9

## Exam board and syllabus

Examination board: Eduqas

Syllabus: Computer Science A500QS A-level

<https://www.eduqas.co.uk/qualifications/computer-science-as-a-level/>

# The Topics

## Systems Architecture

Create an annotated diagram showing how the CPU processes data.

In your diagram include the following information:

1. The CPU and its components and their function
  - a. Arithmetic and Logic Unit (ALU)
  - b. Control Unit (CU)
  - c. Cache
  - d. Registers
    - i. Memory Address Register (MAR)
    - ii. Memory Data Register (MDR)
    - iii. Program Counter
    - iv. Accumulator
  - e. Reference to the fetch-execute cycle

*Remember to explain the purpose of the CPU and the components*

2. Explain how the performance of a CPU is affected by the following
  - a. Increasing the clock speed
  - b. Increasing the cache size
  - c. Increasing the number of processing cores
3. Overclocking
  - a. What does this term mean and how does overclocking improve the CPU's performance?
  - b. What are the problems associated with overclocking a CPU?

## Memory

1. How is memory of a computer used?
2. RAM and ROM are two types of memory found in virtually all systems. How are they used and why are both needed by a system?
3. Explain how virtual memory is used in computer systems.
4. Describe the characteristics of flash memory. How does this work differently to RAM and ROM? What is it used for?



## Storage devices

1. What is a storage device?
2. Why do most computer systems need at least one storage device in addition to memory?
3. Fill in the table below which compares the characteristics of various types of storage devices.

Type	Capacity	Speed	Portability	Durability	Reliability	Cost
<b>Optical</b>						
<b>Magnetic</b>						
<b>Solid-state</b>						

## Networks

1. Networks divide into two categories. Describe some of the similarities and differences between:
  - a. A LAN and a WAN.
  - b. Client-server and peer-to-peer networks.
2. What is the difference between the Internet and the World Wide Web?
3. Describe some of the factors that affect network performance and explain how network performance can be improved. Things to think about include: connection media (e.g. CAT5, coaxial, etc.), bandwidth, error checking.
4. Draw diagrams which shows different network topologies: bus, star, ring and mesh. Remember to label each of the components in your diagrams.
  - a. Explain the purpose of each of the following network components:
    - i. Network Interface Cards
    - ii. Wireless Access Point
    - iii. Router
    - iv. Switch
    - v. Transmission media: cables/wireless.
5. There have been many recent high-profile cyber-attacks across the world, including the attack on the NHS in May 2017. Some commentators have said that “we now rely too much on technology”.

Explain far you agree with this statement including descriptions of threats to systems and actions that can be taken to reduce vulnerabilities.

## Wider computing issues and integrated questions

In answering these question you should refer to your technical knowledge *in context*, referencing any sources that you use.

1. Find out about some of the key computer science pioneers. What have they contributed?

You might want to investigate some of the names in the list below:

- |                                  |                                      |
|----------------------------------|--------------------------------------|
| a. George Boole                  | i. Jonathon Ives                     |
| b. Ada Lovelace                  | j. Larry Page and Sergey Bryn        |
| c. Doris Hopper                  | k. Mark Zuckerberg                   |
| d. Alan Turing                   | l. Guido van Rossum                  |
| e. John Von Neuman               | m. Brian Kernigan and Dennis Ritchie |
| f. Tim Berners-Lee               | n. Ted Codd                          |
| g. Bill Gates                    | o. Thomas Watson Str                 |
| h. Steve Woizniac and Steve Jobs | p. George Moore                      |

2. Create a timeline showing the history of computers science, including any key discoveries or inventions.
3. How do you expect Computer Science to develop over the next 50 years?
4. Compare the gaming consoles: PlayStation and Xbox. Use your technical knowledge to explain your ideas.
5. Discuss the benefits and limitations of Virtual Reality in the following areas:
  - a. Business
  - b. education
  - c. gaming



## Online ISAAC Computing exercise

First you will need to register an account with ISAAC Computing at the URL below

<https://isaacomputerscience.org>

Next, try working through each of the following sections

- Programming concepts [https://isaacomputerscience.org/topics/gcse\\_programming\\_concepts](https://isaacomputerscience.org/topics/gcse_programming_concepts)
- Data representation [https://isaacomputerscience.org/topics/gcse\\_data\\_representation](https://isaacomputerscience.org/topics/gcse_data_representation)
- Boolean logic [https://isaacomputerscience.org/topics/gcse\\_boolean\\_logic](https://isaacomputerscience.org/topics/gcse_boolean_logic)
- Systems [https://isaacomputerscience.org/topics/gcse\\_systems](https://isaacomputerscience.org/topics/gcse_systems)
- Networking [https://isaacomputerscience.org/topics/gcse\\_networking](https://isaacomputerscience.org/topics/gcse_networking)

# Recommended reading/viewing

- 1) Online Wikimedia textbook [https://en.wikibooks.org/wiki/A-level\\_Computing/WJEC\\_\(Eduqas\)](https://en.wikibooks.org/wiki/A-level_Computing/WJEC_(Eduqas))
- 2) An Eduqas Computer Science playlist – a teacher’s YouTube channel explaining topics. The content featured on this channel specifically address the examination syllabus we teach. [https://www.youtube.com/watch?v=gJa2osvqOXQ&list=PLu4\\_j5T9FHeKzFvghlUja0DOXNdT45l8I](https://www.youtube.com/watch?v=gJa2osvqOXQ&list=PLu4_j5T9FHeKzFvghlUja0DOXNdT45l8I)
- 3) MrBrownCS YouTube channel – this is an excellent resource run by a UK computer science teachers which covers a large number of topics at both GCSE and A-level <https://www.youtube.com/channel/UCsBxhDfwURg-vQASN2ZeHwg>
- 4) Craig’n’Dave – a channel run by two computer science teachers covering wide range of A-level topics. <https://www.youtube.com/channel/UC0HzEBLIJxlrwBAHJ5S9JQg>
- 5) Computerphile – Computer Science videos form the University of Nottingham. As you would expect, some of this material is very in-depth, but much featur excellent introduction which explain concepts <https://www.youtube.com/user/Computerphile>