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**Blue Coat School Computer Science**

**GCSE to A-level Transition Pack**

**Student Pack**

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## Using this pack

The transition from working at a GCSE standard to an A-Level is significant, including an increasing emphasis on technical content, extended answers and independent research. This pack is designed to allow you to practice some of these skills, building on the work that you may have covered at GCSE. Whether you have studied GCSE Computer Science or not, and whatever your grade, there will be something here to support your preparation for A-Level.

This transition pack is organised into three sections:

- Computer Science Theory
- Algorithmic Thinking and Problem Solving
- Writing Code

This broadly matches the examination and non-examination assessments of the new GCSEs and A-Levels. Within each section there will be practice questions to support both the content and style of writing required at A-Level, plus various links to books and other resources that you can use to study any topics that require attention. Each section is based on the GCSE specification, so that the content should be familiar if you have already studied GCSE Computer Science; if you are new to the subject, this should give you an overview of the main topic areas that you will study.

The questions are designed to go beyond GCSE standard and prepare you for A-Level study. Some questions are quite straightforward, and test core knowledge. Others are chosen to give you a chance to extend both your thinking and writing skills and to demonstrate your creativity in solving problems. There are also some genuinely hard extension questions if you want them!

There are many different ways that you can use this resource, including:

- As a baseline assessment of skills before starting a course
- To support the development of specific skills
- As a resource to support bridging courses or other pre-course study

Your teacher will direct to the appropriate questions to complete, although there is no reason why you can't explore further on your own.

Note that this is not a "self-study" document on its own. This resources contains questions, prompts, starting points and solutions to help you study one or more core topics before starting the A-Level. However, it is not a text book and you may need to refer to the support resources referenced in order to complete the exercises; where possible these are either existing PiXL resources or are freely available online. A number of interesting books for purchase are also listed; please note that these are no way endorsed by PiXL or any exam board, nor are the authors in any way connected to PiXL (as far as I know). Rather, they are simply books that other staff, or students, have recommended. I leave you to evaluate them yourself.

Answers are in a separate document, so you will have to ask your teacher for those!

# Computer Science Theory

## Recommended resources

1. Isaac Computing
2. Craig and Dave Computer Science Videos – Youtube

## TASK : Chose one area / question from each of the main sections to complete

### Wider computing issues and integrated questions

These questions require you to use your technical knowledge in context. Reference any sources that you use to help you.

1. Create a timeline showing the history of computing, including any key discoveries or inventions. Extend you timeline to show how you think computer science might develop over the next 50 years.
2. Compare the Xbox ONE, PS4 Pro and PC as gaming platforms. You must use as much technical detail as possible and reference any evidence presented. Choose how you will present your ideas.
3. Discuss the benefits and limitations of Virtual Reality
  - a. In business contexts, such as medicine
  - b. As a gaming tool
  - c. As an extension to social media
4. Design the next piece of wearable technology, annotating how it will function and explain the function and purpose of any components used.

### Systems Architecture

1. Produce an annotated diagram showing how the CPU processes data. This should include
  - a. The purpose of the CPU
  - b. Common CPU components and their function
    - i. Arithmetic and Logic Unit (ALU)
    - ii. Control Unit (CU)
    - iii. Cache
    - iv. Registers
      1. Memory Address Register (MAR)
      2. Memory Data Register (MDR)
      3. Program Counter
      4. Accumulator
  - c. Reference to the fetch-execute cycle
2. Discuss, with examples, how the performance of a CPU can be improved, including:
  - a. Increasing the clock speed
  - b. Increasing the cache size
  - c. Increasing the number of processing cores

## Memory

1. Compare RAM and ROM
2. Explain the need for virtual memory in a computer system
3. Describe the characteristics of flash memory

## Storage

1. Complete the following table comparing optical, magnetic and solid state storage media

	Capacity	Speed	Portability	Durability	Reliability	Cost
Optical						
Magnetic						
Solid State						

2. Justify one use of each storage method

## Networks

1. Explain the similarities and differences between
  - a. A LAN and a WAN
  - b. Client-server and peer-to-peer networks
2. Explain the difference between the Internet and the World Wide Web
3. Describe the factors that affect network performance, and explain how network performance can be improved
4. Draw three different network topologies
  - a. Label all the components required to create each network
  - b. Explain the purpose of each component in the network, including
    - i. Wireless Access Points
    - ii. Routers
    - iii. Switches
    - iv. Network Interface Cards
    - v. Transmission media, such as Ethernet Cables
5. Create an interactive presentation or resource, such as a website, that explains how your computer connects to a webpage, such as [www.bbc.co.uk](http://www.bbc.co.uk) Include the following:
  - a. DNS
  - b. Hosting
  - c. TCP/IP, including the concept of layers
  - d. HTTP/HTTPS
  - e. Packet switching
6. 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”. Write an essay explaining how far you agree with this statement and including descriptions of threats to IT systems and ways to reduce vulnerabilities.

## Systems Software

1. Create a presentation comparing Windows, Linux, iOS, Android (which is based on Linux) and Unix. Discuss the features of each operating system, comparing the benefits and limitations of each. Note that you can try a basic Unix interface here: <http://www.masswerk.at/jsuix/>

## Ethical, Legal, Cultural and Environmental Concerns

Find a recent news story on one of the following topics:

- A legal issue in computing, such as a breach of the Data Protection Act
- An ethical issue in computing, such as the development of AI
- An environmental issue in computing, such as the disposal of waste equipment
- A technical development in computer science, such as the Internet of Things

Summarise the story, explaining any technical content for a student in year 10.

Explain how the story affects you as a student of computer science.