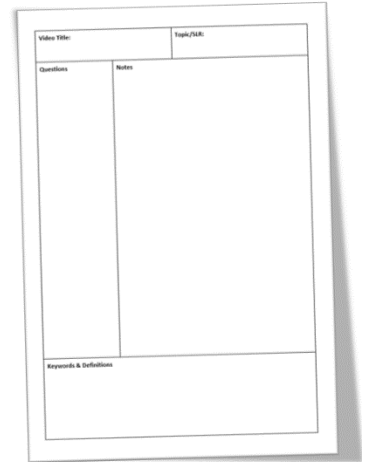# COMPUTER SCIENCE BRIDGING WORK

The Cornell method of note taking

The expectation to do independent research at A Level will increase dramatically from GCSE.

There is a real skill to taking decent notes outside of lesson which are of value. Research has proven that one of the most effective methods is the "Cornell" note taking method.

1. To start download the "Cornell note taking template" from Craig n Dave:

   • https://craigndave.org/product/cornell-note-taking-template/

2. Pick any two of the following videos from Craig 'n' Dave:

   • https://student.craigndave.org/videos/aqa-alevel-slr06-procedural-functional-data-abstraction

   • https://student.craigndave.org/videos/aqa-alevel-slr13-sample-resolution-and-rate

   • https://student.craigndave.org/videos/aqa-alevel-slr13-encryption-vernam-cipher

   • https://student.craigndave.org/videos/aqa-alevel-slr20-bit-rate-baud-rate-bandwidth-and-latency

3. Write the title of the video and its topic in the top boxes (use a different sheet for each video).

4. In the main "Notes" section, write notes from the video. You can do this in any way you like, a suggestion might be to rewind slightly when the canvas changes, thinking carefully about what was important in the previous few minutes.

5. Having recorded the notes, review them:

   • Turn each part into a question in the section on the left.
   • For example, the notes may say, "The value of the program counter is passed to the memory address register".
   • The question then becomes, "which register is the value of the program counter passed to?"
   • Sometimes these questions are easy, and at times they are more difficult to write.
   • There may also be more than one valid question.
   • You will need to decide for yourself which are the most appropriate questions for revision.

6. Finally pull out all the key words and their definitions words the notes and list them in the bottom section.

Programming basics

Learning to "code" is a fun and essential part of A Level Computer Science. This task is ideal if you haven't done the GCSE in Computer Science or you simply want a nice refresher ahead of starting your A Level course.

1. Head over to the web site: https://www.learnpython.org/

2. Complete the following python tutorials under the heading:

   - Hello, World!
   - Variables and Types
   - Lists
   - Basic Operators
   - String Formatting

   - Basic String Operations
   - Conditions
   - Loops
   - Functions

1. Each section presents you with theory, code to run and exercises to try out.

2. If you want to practice writing your own python programs you can download and install a simple python development tool here: https://www.python.org/downloads/ or alternatively set up an account at Replit

Looking under the hood of the processor

The CPU "Central Processing Unit" is the central core of any computer system. You will study what it contains and how it works it in depth at A Level.

1. Start by watching the following 3 videos from Craig 'n' Dave

   1. https://student.craigndave.org/videos/aqa-alevel-slr17-the-processor-and-its-major-components
   2. https://student.craigndave.org/videos/aqa-alevel-slr17-alu-cu-registers-and-buses
   3. https://student.craigndave.org/videos/aqa-alevel-slr17-performance-of-the-cpu

2. Produce a fully annotated diagram on a single sheet of A4 / A3 paper which shows how the CPU works.

3. Make sure the diagram includes and covers:

   1. Major CPU components and what they are for:

      - Arithmetic Logic Unit (ALU)
      - Control Unit (CU)
      - Cache

   2. The main registers

      - Program Counter (PC)
      - Memory Address Register (MAR)
      - Current Instruction Register (CIR)
      - Memory Data/Buffer Register (MDR / MBR)

   3. Fetch-decode-execute cycle

   4. Include annotations which explain how the performance of a CPU can be improved by:

      - Increasing the clock speed
      - Increasing the cache size
      - Increasing the number of cores

Algorithms: from theory to practice

A core concept of computer science is that of data structures and algorithms.

It is also an area which many students struggle with during examinations.

Probably the most basic algorithm is that of the "linear search".

If you have done the GCSE course you will have learnt about this searching algorithm already.

Start by learning or refreshing your knowledge of the linear search algorithm by using the videos on this page:

- https://www.craigndave.org/algorithms-linear-search

Once you are happy with the theory complete the following questions:

1. Describe what the linear search algorithm does.
2. What are the applications of the linear search algorithm?
3. Write out the steps of the linear search algorithm in simple-structured English.
4. Draw a simple diagram which illustrates the linear search algorithm.
5. Write out pseudocode for the linear search algorithm.
   - The algorithm should use an array called items which is pre-populated with the following values: "Florida","Georgia","Delaware","Alabama","California"
   - The algorithm should ask the user to "Enter the state to find:"
   - If the algorithm locates the state entered by the user in the array it should report back to the screen "Item found at position n"
   - If the algorithms can not locate the state entered by the user in the array it should report back to the screen "Item not found"

6. Have a go at coding the linear searching algorithm in a programming language of your choice.

   - The program should work use an array called items which is pre-populated with the following values: "Florida","Georgia","Delaware","Alabama","California"
   - The program should ask the user to "Enter the state to find:"
   - If the program locates the state entered by the user in the array it should report back to the screen "Item found at position n"
   - If the program cannot locate the state entered by the user in the array it should report back to the screen "Item not found"

Representing negative numbers in binary

In GCSE computer science you will have learnt how to represent positive whole numbers in binary e.g. 47. At A Level you will need to know how to represent negative as well e.g. -47

Start by recapping (or learning if you didn't do the GCSE) how to represent positive whole numbers between 0-255 in binary. Now research how to represent negative numbers in binary using the method known as: Two's complement

For additional help and support in structuring your answers you might like to watch some of the following videos from Craig 'n' Dave:

GCSE recap: How to represent positive binary values 0-255:
https://student.craigndave.org/videos/aqa-gcse-slr13-number-bases

A Level: Representing negative binary values using Two's Complement:
https://student.craigndave.org/videos/aqa-alevel-slr11-twos-complement