



# IMPORTANT – PLEASE READ

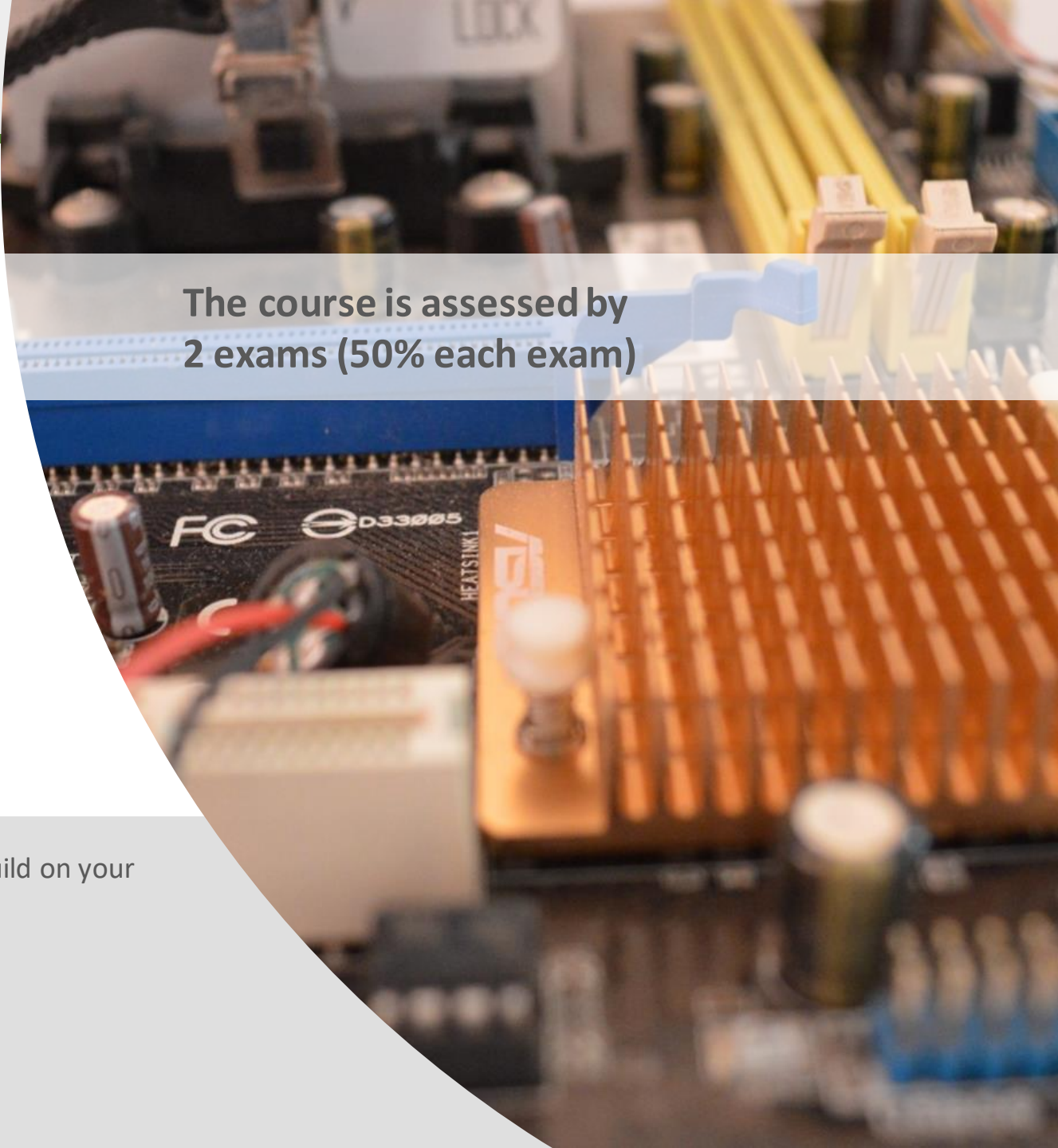
- Please complete the tasks on the following slides, adding evidence onto slide or completing it directly onto the slide where appropriate.
- All tasks 1-10 should be completed by September.
- Complete Presentation with evidence should be sent to Mr Gorvin at [pgorvin@coombedean.co.uk](mailto:pgorvin@coombedean.co.uk)
- Any issues or problems, please see Mr Gorvin before the end of term or email using the address above.

# Computer Science Transition workbook

- The topic of **Computer Science** is at the heart of the modern world
- Studying it can make you extremely sought after in today's job market
- The transition from GCSE to A level is significant, this includes:
  - An increased emphasis on **technical content**
  - An increased emphasis **independent research**

This workbook is designed to allow you to practice some of these skills and build on your existing knowledge.

**Please complete by your first lesson back in September.**



The course is assessed by  
2 exams (50% each exam)

# 1 “Tell me about yourself”

## Why did you choose Computer Science?

Expected time to complete: ½ hour

In this simple task you get the opportunity to tell me your choices and reasons behind choosing to study Computer Science. Please answer all questions as best you can.

1. Why did you choose to study A level Computer Science?

2. What other courses have you chosen to study at Key Stage 5, and what made you choose this combination?

3. What are you hoping to achieve from studying Computer Science?

4. How would you describe yourself as a learner at GCSE? What skills were you good at, what areas would you like to improve on?

5. What are your other hobbies and interests outside of school? Anything related to Computing?

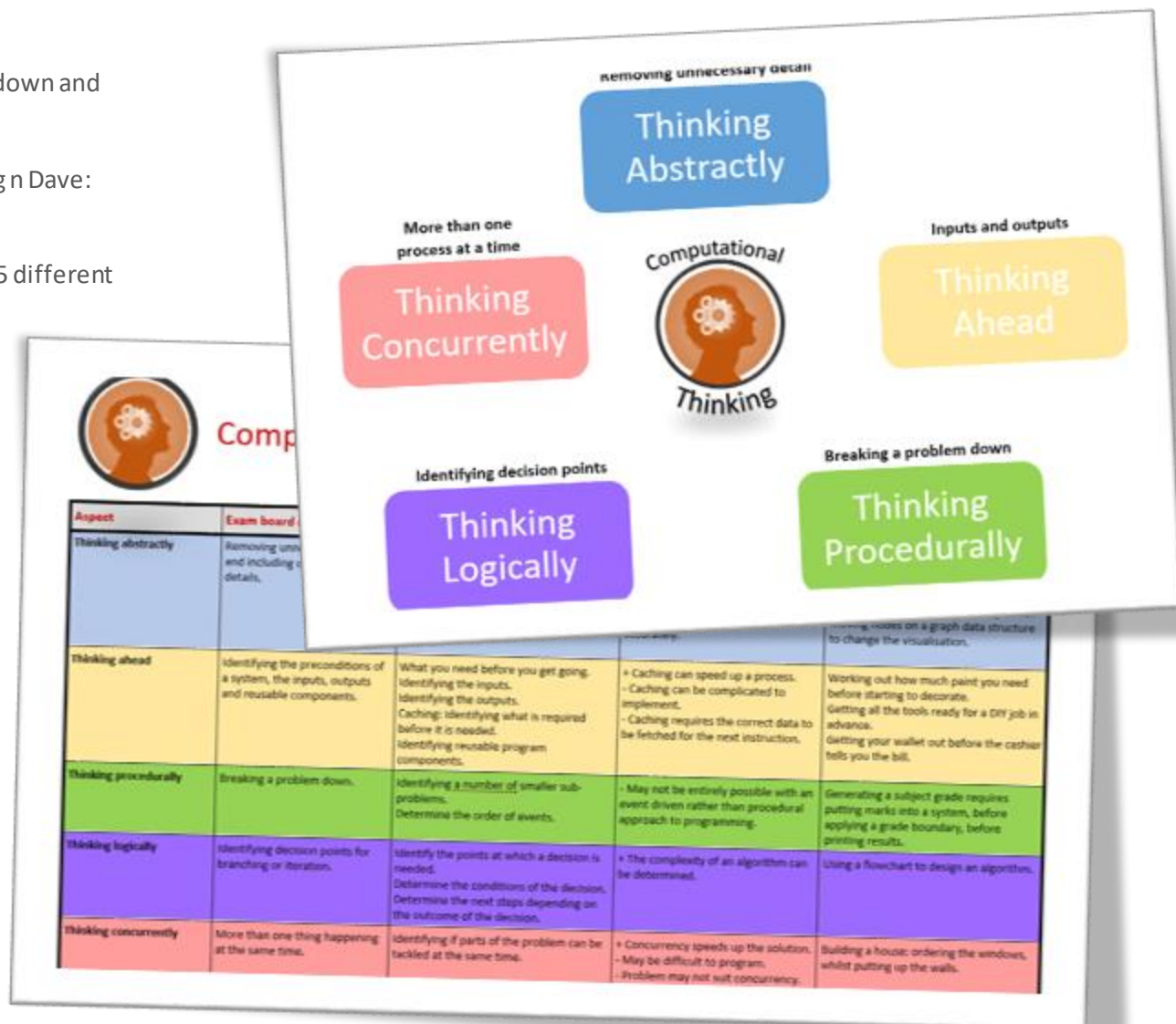
## 2 What is “computational thinking”?

### Thinking like a computer

Expected time to complete: 2 hours

At the heart of Computer Science is the ability to look at problems, analyse them, break them down and solve them in a way which involves a variety of “Computational Thinking” skills.

1. Download the “Computational thinking and Computational methods placemats” from Craig n Dave:
  - <https://student.craigndave.org/specification-key-terminology-and-cheat-sheets>
2. Create your own spider diagram / mind map which shows your clear understanding of the 5 different computational thinking strands
  - Keep it to a single side of A4 / A3
3. Your goal is to imagine someone else has to revise from your mind map. Ask yourself:
  - Does it make sense?
  - Is it clear?
  - Does it cover all of the important concepts?
4. Add evidence of your work on the next slide





Thinking like a computer

Expected time to complete: 2 hours



# 3 Note taking practice task

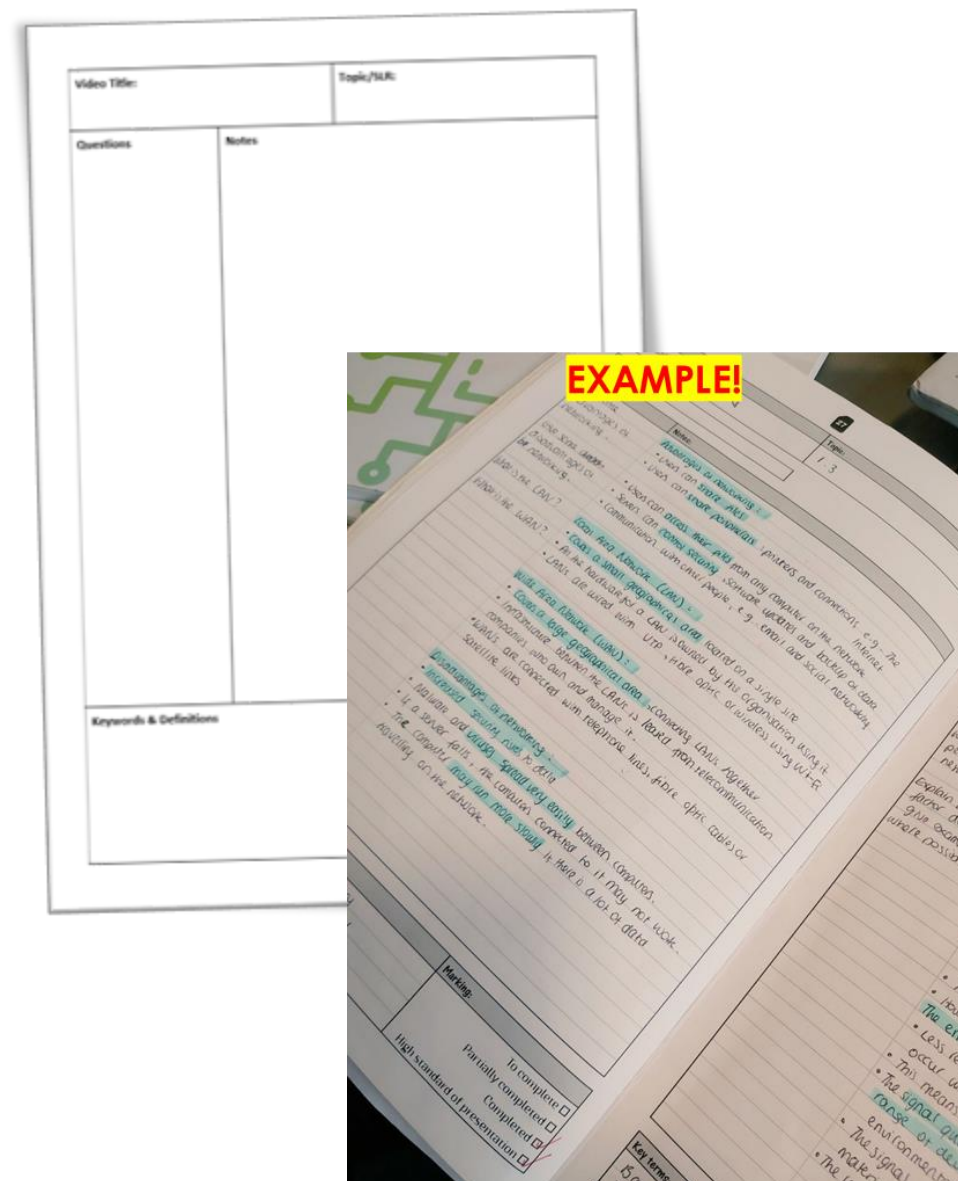
## The Cornell method of note taking

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. A blank template for 'Cornell Notes' has been provided on the next slide
2. Pick any one of the following videos from Craig 'n' Dave:
  - OCR: <https://student.craigndave.org/videos/ocr-a-level-sl01-alu-cu-registers-and-buses>
  - OCR: <https://student.craigndave.org/videos/ocr-a-level-sl04-paging-segmentation-and-virtual-memory>
  - OCR: <https://student.craigndave.org/videos/ocr-a-level-sl05-stages-of-compilation>
  - OCR: <https://student.craigndave.org/videos/ocr-a-level-sl14-data-structures-part-2-graphs>
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.

Expected time to complete: 1½ hours



# 3 Note taking practice task

## The Cornell method of note taking

Expected time to complete: 1½ hours

Video Title:		Topic/SLR:	
Questions	Notes		
Key Terms			



## Programming basics

Expected time to complete: 6 hours

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
3. Each section presents you with theory, code to run and exercises to try out.
4. Add a screen-print of the ‘Exercise’ for each task on the following slide



### Additional note:

This task is most suited to students who intend to do the A Level and have not previously gained much / or any programming experience from the GCSE Computer Science course.

Although the language chosen here is Python, and that may not be what you will be using at A Level, it is the underlying programming concepts which are important.

The list of topics above cover the standard set of programming concepts you would be expected to know having completed a GCSE and Computer Science and so will prepare you well for the A level.





Programming basics (Evidence)

Expected time to complete: 4 hours

## Augmented reality

Expected time to complete: 1½ hours

A key skill at A Level is being able to take a topic and then discuss it in the context of different scenarios.

Most theory-based exam questions will be asked in the form of a scenario, simply regurgitating what you know on the topic without contextualising your answer to the scenario will often result in low marks!

The topic for this exercise is “Augmented Reality”. It is a truly fascinating area of technology which has the potential to change almost every aspect of our daily lives.

Watch this brief video to learn more:

<https://www.youtube.com/watch?v=vQtwWzfzKXI>

After watching the video complete the next slide which asks you to discuss the benefits, limitations and risks of augmented reality in the context of:

- Medicine & health care
- Gaming & entertainment
- Schools & learning
- Travel & tourism
- Social media
- Transport & navigation



Image by Oyundari Zorigtbaatar (20 March 2016) <https://creativecommons.org/licenses/by-sa/4.0/legalcode>



## Augmented reality

Expected time to complete: 1½ hours

### Medicine & health care

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

### Gaming & entertainment

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

### Schools & learning

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

### Travel & tourism

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

### Social media

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

### Transport & navigation

Discuss the **benefits, limitations** and **risks** of augmented reality in this context:

- Enter your answer here

## Looking under the hood of the processor

Expected time to complete: 2 hours

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 (choose from OCR or AQA exam board)
  1. **OCR:** <https://student.craigndave.org/videos/ocr-alevel-slir01-alu-cu-registers-and-buses>
  2. **OCR:** <https://student.craigndave.org/videos/ocr-alevel-slir01-fetch-decode-execute-cycle>
  3. **OCR:** <https://student.craigndave.org/videos/ocr-alevel-slir01-performance-of-the-cpu>
2. Produce a fully annotated diagram on a single sheet of A4/ A3 paper which shows how the CPU works.  
(Blank page provided on next slide)
3. Make sure the diagram includes and covers:
  - Major CPU components and what they are for:
    - Arithmetic Logic Unit (ALU)
    - Control Unit (CU)
    - Cache
  - The main registers
    - Program Counter (PC)
    - Memory Address Register (MAR)
    - Current Instruction Register (CIR)
    - Memory Data/Buffer Register (MDR / MBR)
  - Fetch-decode-execute cycle
  - 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



## 6 Systems architecture task

Looking under the hood of the processor

Expected time to complete: 2 hours

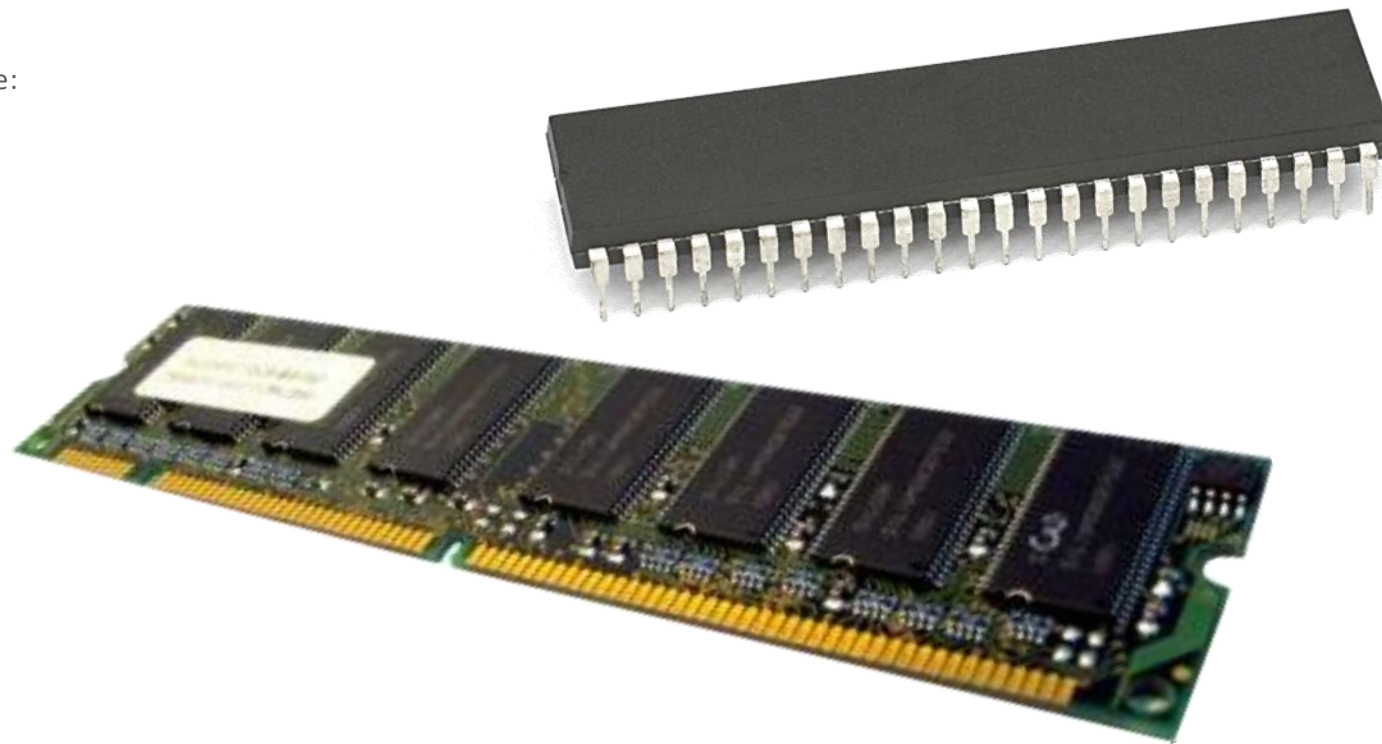
## Different types of memory

Computer memory comes in many different forms, some of the main ones are:

- Random Access Memory (RAM)
- Read Only Memory (ROM)
- Virtual Memory

Carry out some research into these forms of memory and then complete the tasks on the following slide.

Expected time to complete: 1 hour



### Additional help:

For additional help and support in completing this task you might like to watch some of the following videos from Craig 'n' Dave:

RAM and ROM:

<https://student.craigndave.org/videos/ocr-gcse-sl1-2-ram-and-rom>

The need for Virtual Memory:

<https://student.craigndave.org/videos/ocr-gcse-sl1-2-the-need-for-virtual-memory>





## Different types of primary memory



### Random Access Memory (RAM)

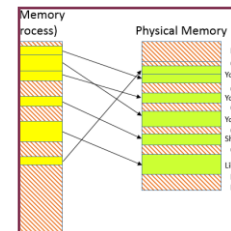
- <Enter a definition for RAM>
- <State if RAM is volatile or non volatile>
- <State if RAM is read only or read & writeable>
- <Describe what sort of information RAM typically holds>



### Read Only Memory (ROM)

- <Enter a definition for ROM>
- <State if ROM is volatile or non volatile>
- <State if ROM is read only or read & writeable>
- <Describe what sort of information ROM typically holds>

Expected time to complete: 1 hour



### Virtual Memory

- <Enter a definition for Virtual Memory>
- <Explain why virtual memory is needed>



## Types of secondary storage

Virtually all secondary storage devices in use today fit into one of three broad categories:

- Magnetic
- Optical
- Solid state

Carry out some research into these categories and then complete the tasks on the following slide.

### Additional help:

For additional help and support in completing this task you might like to watch some of the following videos from Craig 'n' Dave:

Magnetic, Flash and Optical storage:

<https://student.craigndave.org/videos/ocr-alevel-slr03-magnetic-flash-and-optical-storage>

Comparing capacity and speed of storage media:

<https://student.craigndave.org/videos/aqa-alevel-slr18-comparing-capacity-and-speed-of-storage-media>

Expected time to complete: 1 hour





## Types of secondary storage

How does it work?

Enter your answer here...

Advantages / Positives

Enter your answer here...

Disadvantages / Negatives

Enter your answer here...

Examples of typical usage

Enter your answer here...

Typical storage capacity range

Enter your answer here...

# Optical Storage



How does it work?

Enter your answer here...

Advantages / Positives

Enter your answer here...

Disadvantages / Negatives

Enter your answer here...

Examples of typical usage

Enter your answer here...

Typical storage capacity range

Enter your answer here...

# Magnetic Storage



How does it work?

Enter your answer here...

Advantages / Positives

Enter your answer here...

Disadvantages / Negatives

Enter your answer here...

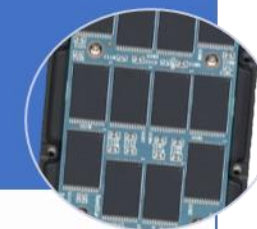
Examples of typical usage

Enter your answer here...

Typical storage capacity range

Enter your answer here...

# Solid State Storage



Expected time to complete: 1 hour

## Truth tables to circuit diagrams

An important area of computer science is understanding the logic gates and diagrams which are used to represent the physical circuitry of computer systems.

Carry out some research into the following areas:

- Logic gates:
  - AND
  - NAND
  - NOR
  - NOT
  - OR
  - XOR
- Truth tables
- Boolean expressions
- Circuit diagrams

Complete the tasks on the following slides.

### Additional help:

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

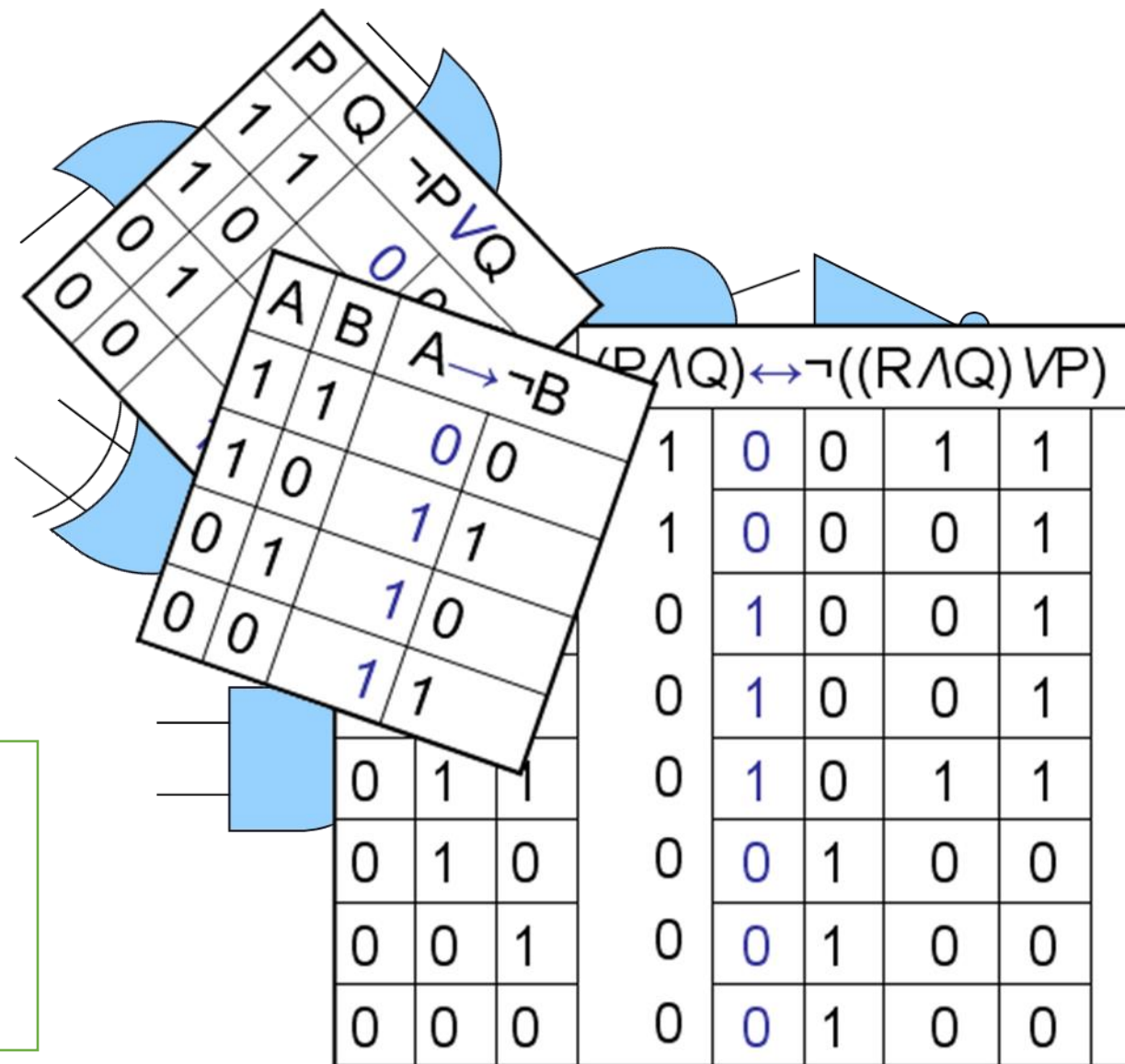
OCR: SLR 15 – Boolean algebra

<https://student.craigndave.org/videos/slr-15-boolean-algebra>

AQA: SLR16 – Logic gates & Boolean algebra

<https://student.craigndave.org/videos/slr16-logic-gates-boolean-algebra>

Expected time to complete: 2 hours



P	Q	$\neg P \vee Q$
1	1	1
1	0	0
0	1	1
0	0	1

A	B	$A \rightarrow \neg B$
1	1	0
1	0	1
0	1	1
0	0	1

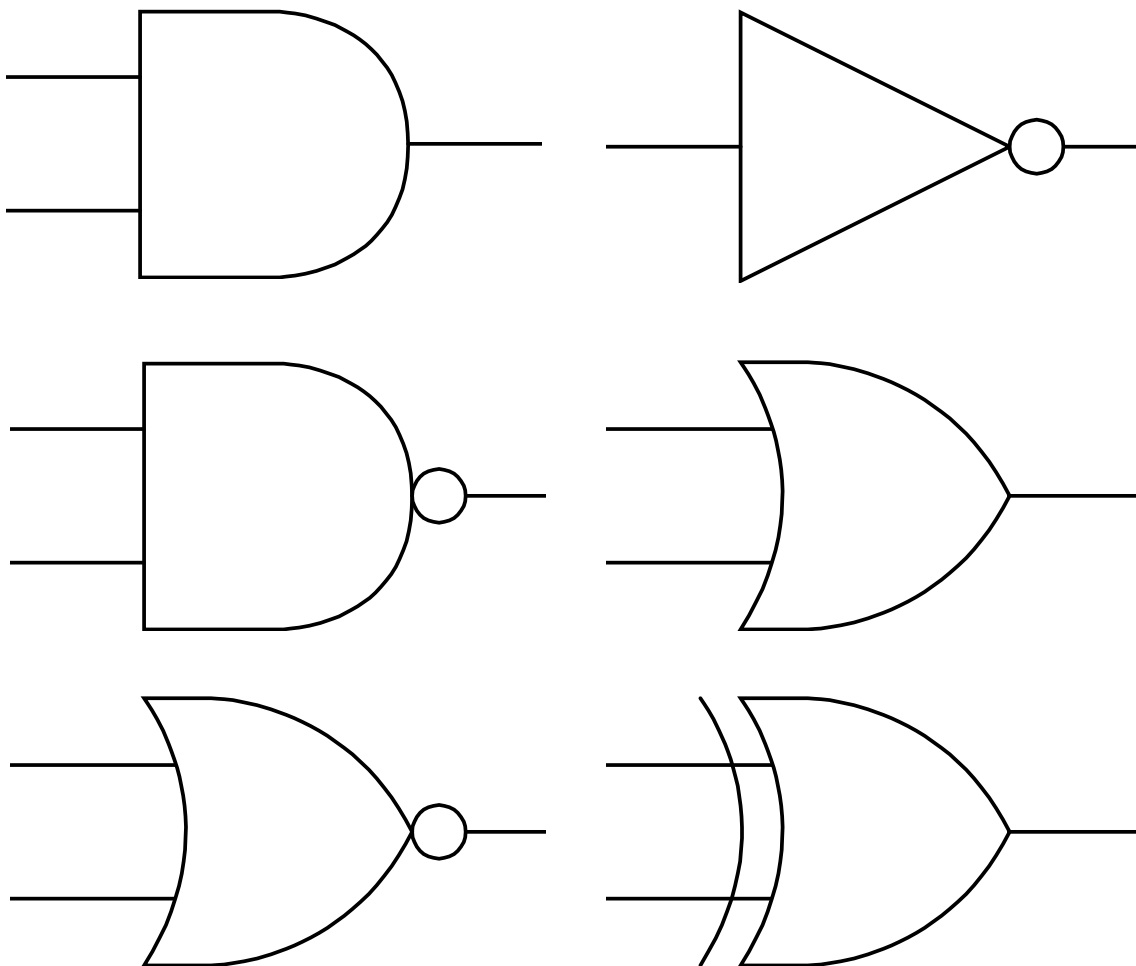
  

$(P \wedge Q) \leftrightarrow \neg((R \wedge Q) \vee P)$				
1	0	0	1	1
1	0	0	0	1
0	1	0	0	1
0	1	0	0	1
0	1	0	1	1
0	0	1	0	0
0	0	1	0	0
0	0	0	1	0

## Truth tables to circuit diagrams

Expected time to complete: 2 hours

1. Drag the labels into their correct place on the following diagram:



OR

AND

XOR

NOT

NAND

NOR

Truth tables to circuit diagrams

2. Draw the circuit diagram which would represent the following Boolean expression:

OCR Boolean Expression:  $F = \neg(\neg C \wedge (A \vee B))$



Expected time to complete: 2 hours

3. Complete the truth table for the circuit diagram you have drawn

A	B	C	D	E	F
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			



## Converting between base-2 (Binary), base-10 (Decimal) and base-16 (Hexadecimal)

Expected time to complete: 1½ hours

As humans we have use the decimal or denary number system (base-10), made up of the unique digits 0-9.

Computer systems at the most basic level use only binary 1's and 0's (base-2).

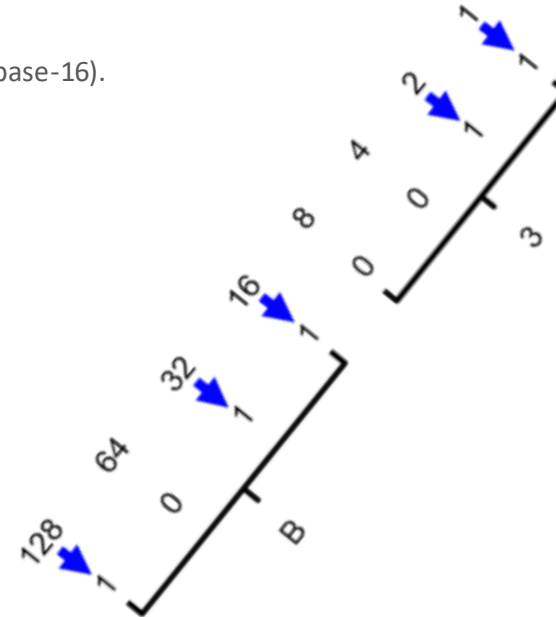
As a computer scientist you will also need to become familiar with the hexadecimal number system (base-16).

You will also need to be comfortable with converting numbers between these three base systems.

Research the following areas:

- Base-2 binary number system
- Base-10 decimal/denary number system
- Base-16 hexadecimal number system
- How to convert between base-2, base-10 and base-16

Complete the tasks on the following slides.



Denary	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

### Additional help:

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

Base 2, 10 and 16 number systems:

<https://student.craigndave.org/videos/aqa-alevel-sl10-base-2-10-and-16-number-systems>

Converting between binary, hex and decimal:

<https://student.craigndave.org/videos/aqa-alevel-sl11-aqa-converting-between-binary-hex-and-decimal>



## Converting between base-2 (Binary), base-10 (Decimal) and base-16 (Hexadecimal)

**Expected time to complete: 1½ hours**

1. Convert the base-2 Binary number 11000101 into base-10 Denary and base-16 Hexadecimal. (Show all your working)

2. Convert the base-16 hexadecimal number 9F into base-2 Binary and base-10 Decimal. (Show all your working)

1. **Introduction**  
 2. **Background**  
 3. **Methodology**  
 4. **Results**  
 5. **Discussion**  
 6. **Conclusion**  
 7. **References**  
 8. **Appendix**  
 9. **Figure 1**  
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 217. **Figure 209**

You may wish to cut and paste this standard binary weighting line to help lay out parts of your answer

[illegible]