

A-Level Computer Science Year 13 Revision Timetable

Revision Checklist Support:

Unit (AQA 7517)	Topic (Revision Checklist)
Unit 4.1 – Programming Fundamentals	Topic 1, Topic 2, Topic 3
Unit 4.2 – Data Structures	Topic 4
Unit 4.3 – Algorithms	Topic 5
Unit 4.4 – Theory of Computation	Topic 6, Topic 7, Topic 8, Topic 9
Unit 4.5 – Data Representation	Topic 10, Topic 11, Topic 12, Topic 13
Unit 4.6 – Computer Systems	Topic 14, Topic 15, Topic 16
Unit 4.7 – Computer Architecture	Topic 17, Topic 18
Unit 4.8 – Legal & Ethical	Topic 19
Unit 4.9 – Computer Networking	Topic 20, Topic 21, Topic 22,
Unit 4.10 – Databases	Topic 23
Unit 4.11 – Big Data	Topic 24
Unit 4.12 – Functional Programming	Topic 25, Topic 26

The Pomodoro technique: Revise for 25 minutes, take a 5-minute break and then revise again for another 25 minutes - then stop.

Look – Cover – Check Method:

1. Read a section of the knowledge organiser page at a time. Each section is indicated using a black rectangular box. For example:

5.1 NUMBER SYSTEMS

Number System	Examples	Explanation
Natural Numbers	$\mathbb{N} = \{0,1,2,3,4, \dots\}$	\mathbb{N} is the set of natural numbers used for counting , e.g. 2 apples.
Integer Numbers	$\mathbb{Z} = \{\dots -2, -1, 0, 1, 2 \dots\}$	\mathbb{Z} is the set of integer numbers, which include the natural numbers and their negative inverses, as shown in the example. Integers have no fractional part.
Rational Numbers	\mathbb{Q} includes: $7/2$, $8/1$, $100/3$, $1/2$, $16/4$...	\mathbb{Q} is the set of numbers that can be written as simple fractions (or ratios of integers). Integers such as 7 are rational numbers as they can be written as $7/1$.

2. Using a dedicated notebook, piece of paper or even flashcard. Close the revision guide and give yourself 60 seconds to write down all the points you can remember.
3. Re-open the revision guide. Then using a **green pen**, read what you have written and tick each correct point. Also use your green pen to make corrections or add missing key information.
4. Give yourself 60 seconds to re-read and repeat the key information in your head – then, close the revision guide and hiding what you had written on the first attempt, then spend 60 seconds more writing everything you can remember.
5. Repeat step 3 but this time use another colour pen. Notice the parts you missed out once or even twice.
6. Repeat steps 1 to 5 for this specific section of text.

Application:

Using the knowledge organisers, test your understanding by using the Progress Check Questions.

Then use the revision plan on the next page, test your understanding at the end of your revision session by answering the questions below.

If you would like Ms Healy to check a specific question, please ask.

Week	Focus 1 (1 Hour)	Key Questions	Focus 2 (1 Hour)	Key Questions
Week 5 - 31 st Jan	Unit 4.5: Data Representation: Binary	<ul style="list-style-type: none"> • Represent negative and positive integers in two's complement. • Perform subtraction using two's complement. • Represent a fixed-point form in binary in a given number of bits. • Represent a floating-point form in binary in a given number of bits. • Explain why both fixed-point and floating-point representation of decimal numbers may be inaccurate. • Calculate the absolute error of binary numbers. • Calculate the relative errors of binary numbers. • Explain why floating-point numbers are normalised and be able to normalise un-normalised floating-point numbers with positive or negative mantissas. 	Unit 4.6: Logic Gates Unit 4.4 : Computation Theory	<ul style="list-style-type: none"> • Construct truth tables for the following logic gates: NOT, AND, OR, XOR, NAND, NOR. • Draw and interpret logic gate circuit diagrams involving one or more of the above gates. • Recognise and trace the logic of the circuits of a half-adder and a full-adder. • Construct the circuit for a half-adder. Be familiar with the use of the edge-triggered D-type flip-flop as a memory unit. • Explain the concept of abstraction – including information hiding, procedural and function abstraction, data abstraction and problem abstraction. • Explain how automation can be used in computer science.
Week 6 - 7 th Feb	Unit 4.7: Internal Components	<ul style="list-style-type: none"> • Explain communication between components, including the concept of a bus and how address, data and control buses are used. • Explain the difference between von Neumann and Harvard architectures and describe where each is typically used. • Explain the role of the dedicated registers, including Program counter, current instruction registers, Memory address register, memory buffer register, status register. • Explain how the Fetch-Execute cycle is used to execute machine code programs including the stages in the cycle (fetch, decode, execute) and details of registers used. 	Unit 4.9: Communication	<ul style="list-style-type: none"> • Explain serial transmission methods • Explain parallel transmission methods. • Discuss the advantages and disadvantages of serial over parallel transmission. • Define synchronous and asynchronous data transmission. • Compare synchronous and asynchronous data transmission. • Define: baud rate, bit rate, bandwidth, latency, protocol. • Explain the difference between bit rate and baud rate. • Explain the relationship between bit rate and bandwidth.

Half Term - 14 th Feb	Unit 4.8: Legal Ethical	<ul style="list-style-type: none"> • Explain moral, ethical, legal and cultural opportunities and risks of computing when used to monitor behaviour. • Explain moral, ethical, legal and cultural opportunities and risks of computing when used to gain and analyse personal information. • Explain moral, ethical, legal and cultural opportunities and risks of computing when used to distribute, publish, communicate and spread personal information • Discuss the issue of scale, for software the whole world over. Include the potential goods, and possible harms. • Discuss the challenges facing legislators in the digital age. 	Unit 4.7: Interrupts and Instructions	<ul style="list-style-type: none"> • Describe the role of interrupts and interrupt service routines (ISRs). • Describe the effect interrupts have on the Fetch-Execute cycle. • Describe the stored program concept: <ul style="list-style-type: none"> ◦ Where is machine code instructions stored? ◦ How are they used in the fetch- execute cycle? ◦ How are they fetched? ◦ How does the processor use the instructions?
Week 7 - 21 st Feb	Unit 4.5: Data Representation: Sound Unit 4.5: Data Representation: Compression	<ul style="list-style-type: none"> • Describe the principles of operation of: <ul style="list-style-type: none"> ◦ an analogue to digital converter (ADC) ◦ a digital to analogue converter (DAC). • Explain the terms: <ul style="list-style-type: none"> ◦ Sample resolution ◦ Nyquist theorem. • Describe the purpose of MIDI • Describe the advantages of using MIDI files for representing music. • Explain the principles behind the following techniques for lossless compression: <ul style="list-style-type: none"> ◦ Run length encoding (RLE) ◦ Dictionary-based methods. 	Unit 4.6: Software Unit 4.6: Languages and Translators	<ul style="list-style-type: none"> • Explain what is meant by system software. • Explain what is meant by application software. • Describe the attributes of the different types of software. • Explain the role and functions of the following system software: <ul style="list-style-type: none"> ◦ Operating systems (OSs) ◦ Utility programs ◦ Libraries ◦ Translators (compiler, assembler, interpreter).
Week 8 - 28 th Feb	Unit 4.9: Networks	<ul style="list-style-type: none"> • Describe and explain the difference between a star and bus topology, including their operation. • Explain and describe situations where the following might be used: Peer-to-peer networking, Client-server networking. • Explain the purpose of WiFi. • Explain how a Wireless Network Adapter and Wireless Access Points are used in a wireless network. • Identify and describe the three methods for protecting a wireless network. • Explain the purpose of Service Set Identifiers (SSIDs). • Explain the wireless protocol Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) with and without Request to Send/ Clear to Send (RTS/CTS). 	Unit 4.7: Input and Output Devices	<ul style="list-style-type: none"> • Explain the main characteristics, purposes, and suitability of the following devices: Barcode Reader, Digital Camera, Laser Printer, RFID • Explain the main principles of operation for a Barcode Reader. • Explain the main principles of operation for a Digital Camera. • Explain the main principles of operation for a Laser Printer. • Explain the main principles of operation for RFID.

Week 9 - 7 th Mar	Unit 4.9: The Internet	<ul style="list-style-type: none"> • Explain the structure of the internet. Include the types of network hardware that would be used and the role of packet switching. • Identify and describe the main components of a packet. • Explain the service provided by Internet registries and why they are needed. • Describe the purpose and function of the domain service and the Domain Name Server (DNS) system. • Explain what a Uniform Resource Locator (URL) is, identify the parts. • Explain the terms 'fully qualified domain name', (FQDN), 'domain name' and 'IP address'. 	Unit 4.7: Assembly Languages and Instructions	<ul style="list-style-type: none"> • Explain the term 'processor instruction set' • Explain the concept of addressable memory • Describe and explain the sections of an instruction (opcode and operands). • Explain immediate and direct address modes. • Use the basic machine-code operations using immediate and direct addressing. • Explain all the basic machine-code operations.
Week 10 - 14 th Mar	Unit 4.7: Secondary Storage	<ul style="list-style-type: none"> • Explain the main characteristics of the following devices: Hard Disk Drive (HDD), Solid-State Disk (SSD), Optical Disk • Explains the principles of operation of a Hard Disk Drive (HDD). • Explains the principles of operation of a Solid-State Disk (SSD) - Including NAND Flash Memory. • Explains the principles of operation of an Optical Disk. • Compare the capacity and speed of access of each secondary storage device. • Explain the suitability of each secondary device for the following applications: <ul style="list-style-type: none"> ○ Transferring data from one computer to another. ○ To store a back-up of a school server. ○ Copies of software for distribution. ○ Regular access and editing of files at work and home. ○ Digital photos for distribution. 	Unit 4.9: Internet Security	<ul style="list-style-type: none"> • Explain how a firewall works, including techniques like packet filtering, proxy servers and stateful inspection. • Explain symmetric and asymmetric (private/ public key) encryption and key exchange. (Can use the example of Alice and Bob). • Explain how digital certificates are obtained and used. • Explain how digital signatures are obtained and used. • Describe and explain worms, trojans and viruses, and the vulnerabilities that they exploit. • Explain method of protection that can be used to address worms, trojans and viruses.

Week 11 - 21 st Mar	Unit 4.10: Databases	<ul style="list-style-type: none"> • Explain the structure and components of a database. Including the following: • attribute <ul style="list-style-type: none"> ◦ Primary key ◦ Composite primary key ◦ Foreign key. • Explain the concept of a relational database. • Explain why databases are normalised. • Explain how to use SQL to retrieve, update, insert and delete data from multiple tables of a relational database. • Produce a set of data and create an entity relationship diagram for it. • Explain the possible types of relationships between tables. 	Unit 4.9 : Protocols	<ul style="list-style-type: none"> • Describe the four layers of the TCP/IP model. Also include how sockets are used in the TCP/IP stack. • Explain the main roles and used of the following protocols: <ul style="list-style-type: none"> ◦ FTP (File Transfer Protocol) ◦ HTTP (Hypertext Transfer Protocol) ◦ HTTPS (Hypertext Transfer Protocol Secure) ◦ POP3 (Post Office Protocol (v3)) ◦ SMTP (Simple Mail Transfer Protocol) ◦ SSH (Secure Shell). • Explain what an IP address is and why there are two standards of IP (v4 and v6). • Explain why a network might use a subnet and know how a subnet can be identified. • Explain the purpose and function of the DHCP system. • Explain the Client-Server Model and why a network might use it. • Compare and contrast thin-client computing with thick-client computing.
Week 12 - 20 th Mar	Unit 4.5: Data Representation: Binary	<ul style="list-style-type: none"> • Represent negative and positive integers in two's complement. • Perform subtraction using two's complement. • Represent a fixed-point form in binary in a given number of bits. • Represent a floating-point form in binary in a given number of bits. • Explain why both fixed-point and floating-point representation of decimal numbers may be inaccurate. • Calculate the absolute error of binary numbers. • Calculate the relative errors of binary numbers. • Explain why floating-point numbers are normalised and be able to normalise un-normalised floating-point numbers with positive or negative mantissas. 	Unit 4.6: Logic Gates Unit 4.4 : Computation Theory	<ul style="list-style-type: none"> • Construct truth tables for the following logic gates: NOT, AND, OR, XOR, NAND, NOR. • Draw and interpret logic gate circuit diagrams involving one or more of the above gates. • Recognise and trace the logic of the circuits of a half-adder and a full-adder. • Construct the circuit for a half-adder. Be familiar with the use of the edge-triggered D-type flip-flop as a memory unit. • Explain the concept of abstraction – including information hiding, procedural and function abstraction, data abstraction and problem abstraction. • Explain how automation can be used in computer science.