OCR GCSE Computer Science Revision Checklist

OCR Component 01

Computing Systems

80 marks – 1 hour and 30 minutes, Written paper

(no calculators allowed)

1.1 – Systems Architecture

1.2 – Memory and Storage

1.3 – Computer Networks, connections and protocols

1.4 – Network Security

1.5 – Systems Software

1.6 – Ethical, Legal, Cultural & Environmental impacts of digital technology

OCR Component 02

Computational Thinking, Algorithms & Programming

80 marks – 1 hour and 30 minutes, Written paper

(no calculators allowed)

2.1 – Algorithms

2.2 – Programming fundamentals

2.3 – Producing Robust Programs

2.4 – Boolean Logic

2.5 – Programming languages and Integrated Development Environments & Facilities of Languages

- Courtesy of CraigNDave this checklist can be used to focus your revision on certain topics.
- All the topic areas above have a hyperlink to the YouTube CraigNDave videos.
- Use your Cornell note book to write notes from the videos and your revision guide to answer past exam questions.

1.1 Systems Architecture

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
The purpose of the CPU- The fetch-execute cycle			
Von Neumann architecture:			
MAR (Memory Address Register)			
MDR (Memory Data Register)			
Program Counter			
Accumulator			
Common CPU components and their function:			
ALU (Arithmetic Logic Unit) & CU (Control Unit)			
The purpose of each **register**, what it stores (data or address)			
Cache			
How common characteristics of CPUs affect their performance:			
clock speed			
cache size			
number of cores			
Embedded systems:			
purpose of embedded systems			
examples of embedded systems and their characteristics			

1.2 Memory and Storage

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Primary Storage (memory)			
The need for primary storage			
The difference between RAM and ROM			
The purpose of ROM and RAM in a computer system			
Why **virtual memory** is needed in a system			
Secondary storage			
The need for secondary storage in computers			
Compare the differences between each type of storage device			
Be able to explain where different secondary storage is used			
Common types of storage:			
solid state, optical, magnetic			
Suitable storage devices and storage media for a given application, and the advantages and disadvantages of these, using characteristics:			
Capacity- which secondary storage has the most/ least?			
Speed- which secondary storage is the fastest read/write?			
Portability- which secondary storage is the lightest? Heaviest?			
Durability- which secondary storage will last for the longest?			
Reliability- which secondary storage is reliable?			
Cost- which secondary storage is the cheapest per byte?			

1.2 Memory and Storage

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Units:			
bit, nibble, byte, kilobyte, megabyte, gigabyte, terabyte, petabyte			
how data needs to be converted into a binary format to be processed by a computer			
Numbers:			
how to convert denary whole numbers (0–255) into 8 bit binary numbers and vice versa			
how to add two 8 bit binary integers and explain overflow errors which may occur			
Carry out Left and right binary shifts			
how to convert positive denary whole numbers (0–255) into 2 digit hexadecimal numbers and vice versa			
how to convert from binary to hexadecimal equivalents and vice versa			
check digits			
Characters:			
the use of binary codes to represent characters			
the term ‘character-set’			
the relationship between the number of bits per character in a character set and the number of characters which can be represented (for example ASCII, extended ASCII and Unicode).			

1.2 Memory and Storage

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Images:			
how an image is represented as a series of pixels represented in binary			
metadata included in the file			
the effect of colour depth and resolution on the size of an image file.			
Sound:			
how sound can be sampled and stored in digital form			
how sampling intervals and other factors affect the size of a sound file and the quality of its playback:			
sample size- stored in bits			
Sample rate- measured in Hertz (Hz)			
sampling frequency			
Compression:			
need for compression in a **range of scenarios**			
types of compression:			
Lossy- **When is this used? Why? What happens to the file?**			
Lossless- **When is this used? Why? What happens to the file?**			

1.3 Computer networks, connections and protocols

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Types of networks:			
LAN (Local Area Network)- **Characteristics & examples**			
WAN (Wide Area Network)- **Characteristics & examples**			
Factors that affect the performance of networks- Devices/ Bandwidth			
The roles of computers in a client-server and a peer-to-peer network			
The hardware needed to connect stand-alone computers into a Local Area Network:			
wireless access points			
routers/switches			
NIC (Network Interface Controller/Card)			
transmission media			
The internet as a worldwide collection of computer networks:			
DNS (Domain Name Server)			
hosting			
the cloud			
Web servers and clients			
Star and mesh network topologies			

1.3 Computer networks, connections and protocols

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Modes of connection- Benefits/ drawbacks for each connection			
Wired- ethernet			
Wireless- Wi-Fi & Bluetooth			
Encryption			
IP addressing and MAC addressing			
Standards & how they allow hardware/software to interact across different manufacturers/ producers			
Common Protocols including:			
TCP/IP (Transmission Control Protocol/Internet Protocol)			
HTTP (Hyper Text Transfer Protocol)			
HTTPS (Hyper Text Transfer Protocol Secure)			
FTP (File Transfer Protocol)			
POP (Post Office Protocol)			
IMAP (Internet Message Access Protocol)			
SMTP (Simple Mail Transfer Protocol)			
the concept of layers			
packet switching.			

1.4 Network security

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Forms of attack- How are each used and what are the purposes?			
malware			
Social engineering e.g. phishing			
people as the 'weak point' in secure systems (social engineering)			
brute force attacks			
denial of service attacks			
data interception and theft			
the concept of SQL injection			
poor network policy			
Identifying and preventing vulnerabilities: What does each of these limit/ prevent? How do they limit the attacks?			
penetration testing			
network forensics			
network policies			
anti-malware software			
firewalls			
user access levels			
passwords			
encryption.			

1.5 Systems software

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
The purpose and functionality of systems software			
Operating systems:			
user interface- **Features**			
memory management/multitasking e.g. transfer of data between memory, and how this allows for multitasking			
peripheral management and drivers			
user management e.g. Allocation of accounts, access rights, security			
file management e.g. Naming, allocating to folders, moving file, saving etc			
Utility system software:			
encryption software			
defragmentation			
data compression			
the role and methods of backup:			
full			
incremental			

1.6 Ethical, legal, cultural and environmental impacts of digital technology

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
How to investigate and discuss Computer Science technologies while considering:			
ethical issues			
legal issues			
cultural issues			
environmental issues.			
privacy issues			
Required			
Technology introduces ethical, legal, cultural, environmental and privacy issues			
Knowledge of a variety of examples of digital technology and how this impacts on society			
An ability to discuss the impact of technology based around the issues listed			

1.6 Ethical, legal, cultural and environmental impacts of digital technology

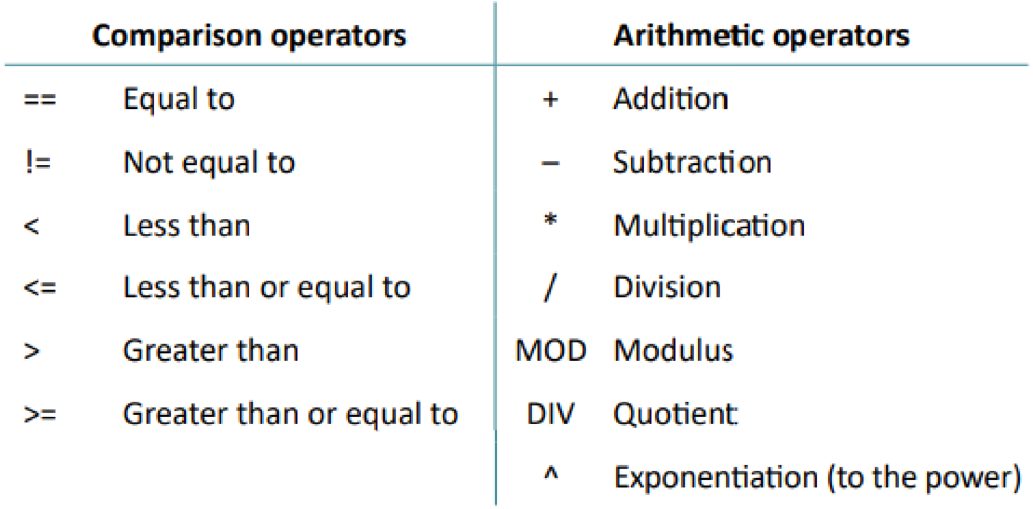
Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Legislation relevant to Computer Science:			
The Data Protection Act 1998			
Computer Misuse Act 1990			
Copyright Designs and Patents Act 1988			
Software licences i.e. Open source proprietary			
Required			
The purpose of each piece of legislation and the specific actions it allows or prohibits			
The need to license software and the purpose of a software license			
Open source and proprietary software			
Features of open source (providing access to the source code and the ability to change the software)			
Features of proprietary (no access to the source code, purchased commonly as off-the-shelf)			
Recommend a type of license for a given scenario including benefits and drawbacks			

2.1 Algorithms

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Computational thinking: Understand these principles and how they are used to define and refine problems.			
Abstraction/ decomposition/ algorithmic thinking			
Designing, creating and refining algorithms:			
Identifying the inputs, processes, and outputs for a problem			
Structure diagrams			
pseudocode			
using flow diagrams			
Reference language/high-level programming language			
Identify syntax/logic errors in code and suggest fixes			
Create and us Trace tables to follow an algorithm			
Standard searching algorithms: Understand the main steps of each algorithm. Understand the pre-requisites of an algorithm . Apply the algorithm to a data set. Identify an algorithm if given the code or pseudocode for it.			
binary search/ & linear search			
Standard sorting algorithms:			
bubble sort			
merge sort			
insertion sort			

2.2 Programming fundamentals

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
The use of variables, constants, operators, inputs, outputs and assignments			
The use of the three basic programming constructs used to control the flow of a program:			
sequence			
selection			
iteration (count and condition controlled loops)			
The common Boolean operators AND, OR and NOT			
The common arithmetic and comparison operators			



Comparison operators		Arithmetic operators	
==	Equal to	+	Addition
!=	Not equal to	–	Subtraction
<	Less than	*	Multiplication
<=	Less than or equal to	/	Division
>	Greater than	MOD	Modulus
>=	Greater than or equal to	DIV	Quotient
		^	Exponentiation (to the power)

2.2 Programming fundamentals

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
The use of data types- Integer, Real, Boolean, Character and String, Casting			
The use of basic string manipulation e.g. Slicing and concatenation			
The use of basic file handling operations: open, read, write, close			
The use of records to store data			
The use of SQL to search for data			
SELECT/ FROM/ WHERE			
The use of arrays (or equivalent) when solving problems, including both one and two dimensional arrays			
Arrays as fixed length or static structures			
Use of 2D arrays to emulate database tables of fields, and records			
How to use sub-programs to provide structured code			
the use of **functions** and the use of **procedures**			
Where to use functions and procedures effectively			
The use of the following within functions and procedures:			
local variables/constants			
global variables/constants			
arrays (passing and returning)			
To be able to create and use random numbers in a program			

2.3 Producing robust programs

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Defensive design considerations:			
Anticipating misuse-			
Understanding of the issues a programmer should consider to ensure that a program caters for all likely input values			
Authentication			
Authentication to confirm the identity of a user			
Practical experience of designing input validation and simple authentication (e.g. username and password)			
Input validation			
Understanding of how to deal with invalid data in a program			
Maintainability:			
Use of sub programs			
Naming conventions			
Comments- why it is useful and apply this appropriately			
indentation			

2.3 Producing robust programs

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
The purpose of testing			
Types of testing: The difference between testing modules of a program during development (**iterative**) and testing the program at the end of production (**final/terminal**).			
How to identify syntax and logic errors			
Syntax errors as errors which break the grammatical rules of the programming language and stop it from being run/translated			
Logic errors as errors which produce unexpected output			
Selecting and using suitable test data			
Normal test data as data which should be accepted by a program without causing errors			
Boundary test data as data of the correct type which is on the very edge of being valid			
Invalid test data as data of the correct data type which should be rejected by a computer system			
Erroneous-test data as data of the incorrect data type which should be rejected by a computer system			
Ability to identify suitable test data for a given scenario			
Ability to create/complete a test plan			
Refining algorithms			

2.4 Boolean logic

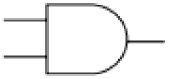
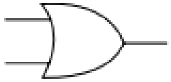
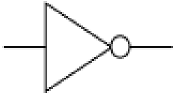
Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Simple logic diagrams using the operations AND, OR and NOT			
Truth tables			
Combining Boolean operators using AND, OR and NOT to two levels			
Applying logical operators in appropriate truth tables to solve problems			

Required

- ✓ Knowledge of the truth tables for each logic gate
- ✓ Recognition of each gate symbol
- ✓ Understanding of how to create, complete or edit logic diagrams and truth tables for given scenarios
- ✓ Ability to work with more than one gate in a logic diagram

Alternatives

- Use of other valid notation will be accepted within the examination, e.g. Using T/F for 1/0, or V for OR, etc.

Boolean Operators	Logic Gate Symbol
AND *(Conjunction)*	
OR *(Disjunction)*	
NOT *(Negation)*	

Truth Tables

AND			OR			NOT	
A	B	A AND B	A	B	A OR B	A	NOT A
0	0	0	0	0	0	0	1
0	1	0	0	1	1	1	0
1	0	0	1	0	1		
1	1	1	1	1	1		

2.5 Programming languages and integrated development environments

Specific knowledge required for GCSE Computer Science j277	Need to Revise	Revised Once	Got it!
Characteristics and purpose of different levels of programming language:			
High-level language			
Low-level language			
The purpose of translators			
The characteristics of a compiler and an interpreter			
The differences, benefits and drawbacks of using a compiler or an interpreter			
Common tools and facilities available in an integrated development environment (IDE):			
Editors- Knowledge of the tools that an IDE provides			
error diagnostics- helps a programmer develop a program			
run-time environment- helps a programmer develop a program			
translators			