

Specification
Systems architecture
the purpose of the CPU
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)
Cache
the function of the CPU as fetch and execute instructions stored in memory
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.
Memory
the difference between RAM and ROM
the purpose of ROM in a computer system
the purpose of RAM in a computer system
the need for virtual memory
flash memory
Storage
the need for secondary storage
data capacity and calculation of data capacity requirements
common types of storage:
optical
magnetic
solid state
suitable storage devices and storage media for a given application, and the advantages and disadvantages of these, using characteristics:
capacity
speed

portability
durability
reliability
cost
Wired and wireless networks
types of networks:
LAN (Local Area Network)
WAN (Wide Area Network)
factors that affect the performance of networks
the different 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
the concept of virtual networks
Network topologies, protocols and layers
star and mesh network topologies
Wifi:
frequency and channels
encryption
ethernet
the uses of IP addressing, MAC addressing, and 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
System security

forms of attack
threats posed to networks:
malware
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:
penetration testing
network forensics
network policies
anti-malware software
firewalls
user access levels
passwords
encryption
Systems software
the purpose and functionality of systems software
operating systems:
user interface
memory management/multitasking
peripheral management and drivers
user management
file management
utility system software:
encryption software
defragmentation
data compression
the role and methods of backup:
full
incremental
Ethical, legal, cultural and environmental concerns
how to investigate and discuss Computer Science technologies while considering:
ethical issues

legal issues
cultural issues
environmental issues
privacy issues
how key stakeholders are affected by technologies
environmental impact of Computer Science
cultural implications of Computer Science
open source vs proprietary software
legislation relevant to Computer Science:
The Data Protection Act 1998
Computer Misuse Act 1990
Copyright Designs and Patents Act 1988
Creative Commons Licensing
Freedom of Information Act 2000.
Algorithms
computational thinking:
abstraction
decomposition
algorithmic thinking
standard searching algorithms:
binary search
linear search
standard sorting algorithms:
bubble sort
merge sort
insertion sort
how to produce algorithms using:
pseudocode
using flow diagrams
interpret, correct or complete algorithms
Programming techniques
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 use of basic string manipulation

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
the use of arrays (or equivalent) when solving problems, including both one and two dimensional arrays
how to use sub programs (functions and procedures) to produce structured code
the use of data types:
integer
real
Boolean
character and string
casting
the common arithmetic operators
the common Boolean operators
Producing robust programs
defensive design considerations:
input sanitisation/validation
planning for contingencies
anticipating misuse
authentication
maintainability:
comments
indentation
the purpose of testing
types of testing:
iterative
final/terminal
how to identify syntax and logic errors
selecting and using suitable test data
Computational logic
why data is represented in computer systems in binary form
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
applying computing-related mathematics:
+
-
/
*
Exponentiation (^)
MOD
DIV
Translators and facilities of languages
characteristics and purpose of different levels of programming language, including low level languages
the purpose of translators
the characteristics of an assembler, a compiler and an interpreter
common tools and facilities available in an integrated development environment (IDE):
editors
error diagnostics
run-time environment
translators
Data representation
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 positive 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
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).
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
bit rate
sampling frequency
Compression
need for compression
types of compression:
lossy
lossless