

Computer Science

Pre-Exam

Revision

# LEARNING OUTCOMES

## ASPIRE

To be able to build on computer science knowledge and apply this to the computer science exam

## CHALLENGE

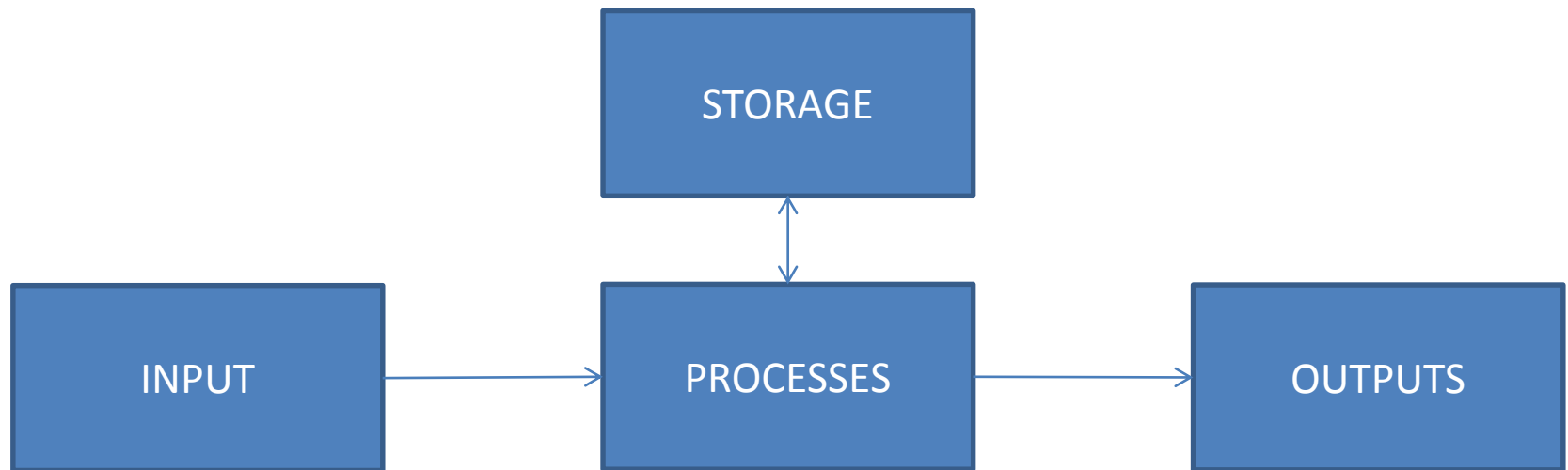
To be able to extend on current computer science knowledge in preparation for exam

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# Computer Fundamentals

What is a computer system?

A computer system receives inputs, processes, outputs, storage



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# Computer Fundamentals

Can you name some examples of computers and their system?

Mobile phones, laptops, tablets, smart TV's

Burglar alarm systems, theme park ride control, train times, car engine management, holiday booking etc.

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# Computer Fundamentals

Example – Holiday Booking?

**Input** – dates, destinations, credit card details

**Output** – booking confirmation, air tickets, hotel reservations

**Processing** – check availability, reserve flight, produce documents

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# Computer Fundamentals

What are the 6 types of computer systems?

- **General purpose** – desktops, laptops etc  
– designed to perform multiple tasks
- **Dedicated systems** – single function –  
ticket machine at train station
- **Control systems** – control machinery,  
used in manufacturing

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# Computer Fundamentals

- **Embedded systems** – sat nav, washing machine – part of a larger system
- **Expert systems** – behave like a human – diagnosing diseases, suggesting mortgages
- **Management Information System** – technology, data, people – collate information make sensible decisions

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# Computer Fundamentals

Why is reliability important?

Life/death situations

- Medical, Aircraft navigation etc

Day to day situations

- Purchases, Deliveries etc

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# Computer Fundamentals

What is meant by the term Data Integrity?

Accuracy of data

How can Data Integrity be compromised?

Human error

Software bugs

Viruses

Hardware malfunction

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# Computer Fundamentals

How can reliability be improved?

Testing:-

- Testing software
- Testing hardware
- Updating
- Checking back-ups
- Testing duplicate systems

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# Computer Fundamentals

What is are the 3 areas of “The Computer Misuse Act”?

1. Unauthorised access to computer programs or data
2. Unauthorised access with a further criminal intent (known as the ‘ulterior intent’ offence)
3. Unauthorised modification of computer material.

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# Computer Fundamentals

What are the 8 principles of “The data protection Act”?

- Data must be processed fairly.
- It can only be used for the purpose they have said it will.
- They should only hold data they actually need.
- Data must be accurate and up to date.
- Data must not be held longer than it is needed for.
- Data will be used in accordance with your rights.
- Data will be kept safe.
- Data will not be transferred to any country where they don't have similar laws.

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# Computer Fundamentals

What is meant by the term “copyright”?

- To ensure people are rewarded for their endeavours
- To give protection to the copyright holder if someone tries to copy or steal their work

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# Computer Fundamentals

What does DRM stand for?

- Digital Rights Management
- It is a technology used to limit the playback of certain types of media on devices.

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# Computer Fundamentals

What impact does increased use of digital devices have on the environment?

- Increased use of electricity.
- Waste equipment to be disposed of.
- Recycling needed.
- Toxic substances released into the environment.

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# Computer Fundamentals

Can you name the 5 standards?

- **De facto** – develop over time – Qwerty keyboard
- **Proprietary** – organisation-compatibility company products -Apple
- **Industry** – generally hardware – e.g. USB
- **Open** – publically available – HTTP, HTML etc.
- **Development** – computer systems/programs

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# Computer Fundamentals

What are the 3 different licenses available?

- **Single user** – 1 workstation
- **Multi user** – Family – 3 workstation
- **Site – School** – All computers on site

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# Hardware

What is the CPU and what does it do?

Central Processing Unit

- **Fetch** – the instruction from memory
- **Decode** – the instruction to find out what processing to do
- **Execute** – the instruction

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# Hardware

What is the ALU?

Arithmetic Logic Unit

- Carries out all of the arithmetic and logical operations

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# Hardware

What is the boot sequence?

- A sequence of processes that contain all the information to get the computer up and running.
- Activated when the computer is switched on.

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## Hardware

What is meant by the term clock speed?

- The speed of the fetch –execute cycle is determined by the clock speed
- The clock speed is measured in cycles per second – hertz (Hz)
- The higher the clock speed the more processes per second

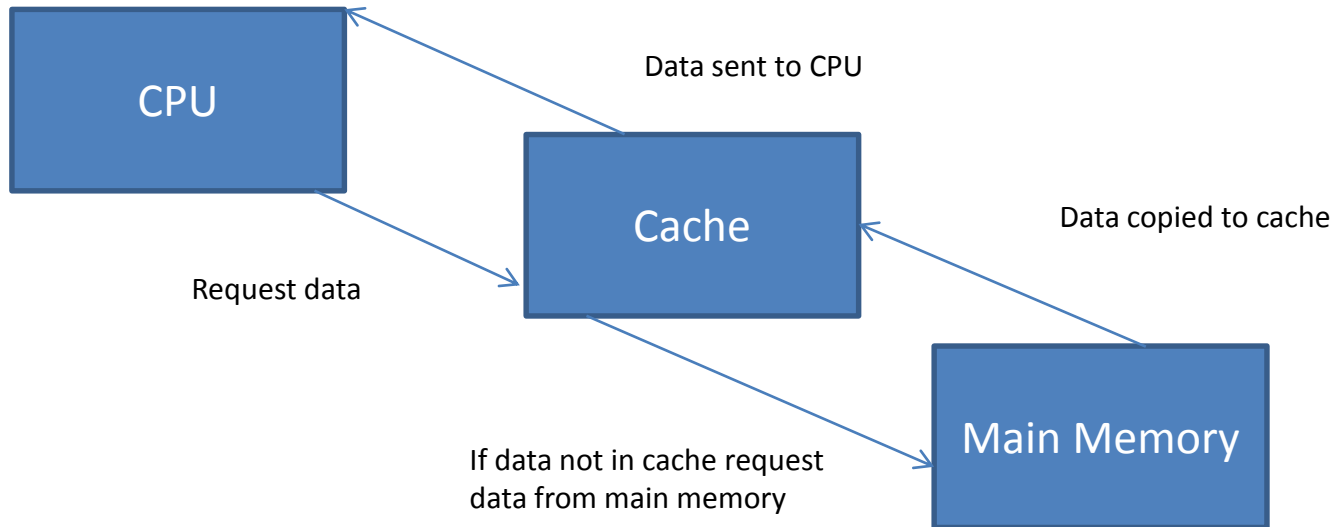
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# Hardware

## What is Cache Memory?

Stores regularly used data so that the CPU can access/process it quicker



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## Hardware

What is Dual Core and Quad Core?

**Dual Core** – Two processors

**Quad Core** - Four processors

More data can be processed simultaneously – **can all fetch, decode, execute at the same time**

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# Hardware

What is RAM?

Random Access Memory

- **Volatile** (data is lost when computer turned off)
- **Stores programs and data** being used by the computer
- **Large capacity** memory (4GB+ in typical computer)

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# Hardware

What is ROM?

Read Only Memory

- **Non-Volatile** (data is retained when computer turned off)
- **Stores programs and data** used to start up the computer (boot program)
- **Small capacity** memory (1-2MB)

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## Hardware

### What is virtual memory?

- Virtual memory is part of the hard drive used as an extension to RAM
- It is used when the computer does not have enough RAM to hold all the data and programs required
- Data is passed between RAM and virtual memory – access to virtual memory is slower than RAM
- Adding more RAM reduces the use of virtual memory and improves the performance of the computer

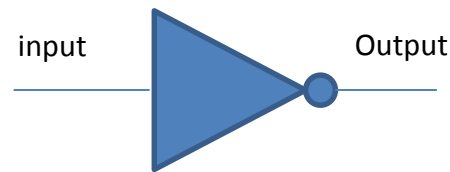
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# Hardware

What is this logic gate called? What would the output be?

Input	Output
0	
1	



Input	Output
0	1
1	0

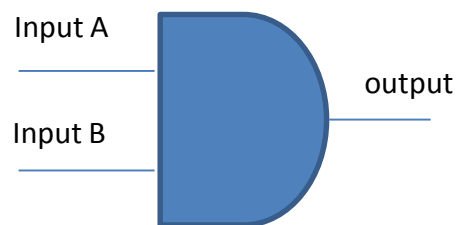
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# Hardware

What is this logic gate called? What would the output be?

Input A	Input B	Output
0	0	
0	1	
1	0	
1	1	



Input A	Input B	Output
0	0	0
0	1	0
1	0	0
1	1	1

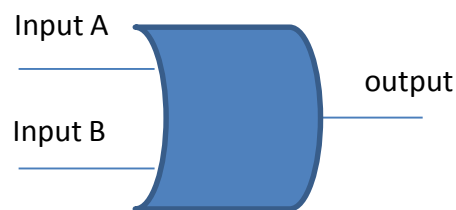
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Input A	Input B	Output
0	0	
0	1	
1	0	
1	1	



Input A	Input B	Output
0	0	0
0	1	1
1	0	1
1	1	1

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# Hardware

List 3 input devices?

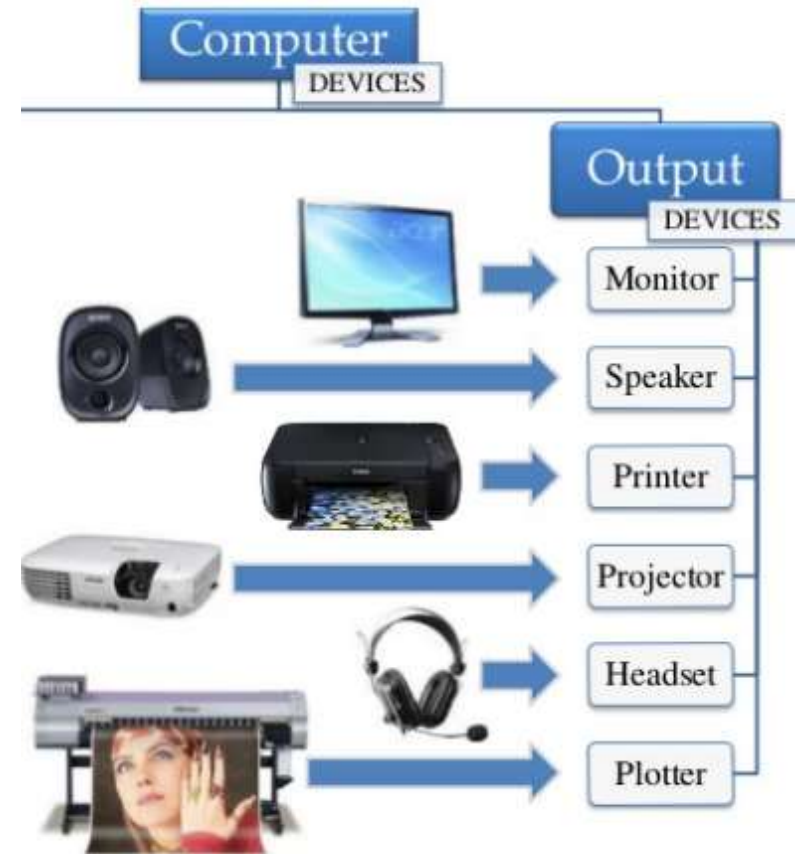


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# Hardware

List 3 output devices?



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# Hardware

List 2 input/output devices for disabilities?



Impulse electromyograph



Eyegaze Edge eye-motion sensor



Jouse2 "sip and puff" system



SmartNav 4:AT head-motion tracker



BrailleNote Apex note taker



Camera Mouse head-tracking software



Light operated mouse and keyboard



NoHands foot-operated mouse



BigKeys LX keyboard



soundAMP amplification app



ZoomText screen magnifier/reader



InfoScan TS Elite scanning pen



Intel Reader e-book reader



Braille+ Mobile Manager PDA

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## Hardware

What is secondary storage?

Secondary storage is needed to store data and programs when the computer is switched off.

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# Hardware

What is Magnetic storage?

A magnetic hard disk – uses magnetised surfaces to stores the operating system, installed programs & user data

- **Reliable**
- **High capacity**
- **Low cost**



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# Hardware

What is Optical storage?

An optical disk uses patterns of reflection of a laser for transferring files or distributing software CD – 700MB, DVD – 4.7GB storage

- **Lightweight & Portable**
- **Good capacity**
- **Low cost**
- **Slow**



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# Hardware

What is Solid State storage?

Flash Memory– uses electronic components in a circuit - consumes little power

- Portable – used in hand held devices
- Low capacity
- Expensive for higher capacity
- Low power consumption



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# Hardware

Can you give examples of what different types of storage would be used for?

SCENARIO	WHICH DEVICE FITS BEST
Transport a presentation between home and school	USB solid state
Backup holiday photographs	Writeable DVD (optical disc)
Distribute a program for people to install	Read only optical disc (CD or DVD)
Store a large graphics application for use on a computer.	Magnetic storage drive (hard drive)
Making a complete backup of my computer's files	External hard drive

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## Software

What are the 3 main types of software?

**System software** – controls the hardware

**Application software** – handles real world jobs

**Utility software** – used to maintain computer systems

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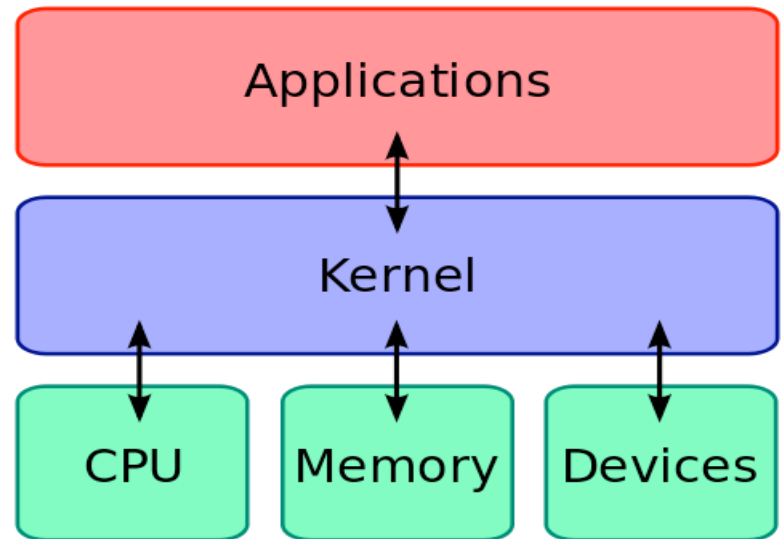
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# Software

Give an example of system software?

The operating system is the main part of system software. It controls the hardware.

The kernel is the part of the operating system that actually makes the hardware do things



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## Software

What are the functions of the operating system?

- Controls the hardware and software
- Communicates with device drivers
- Provides a user interface
- Stores/saves documents
- Controls multi-tasking
- Controls access to disk drives for reading, writing and formatting

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# Software

Explain the following interfaces?

1. Graphical User Interface
2. Command Line Interface
3. Menu Driven Interface

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## Software

Explain the different aspects of utility software?

- **Security** – **Antivirus** – detect and remove viruses (self-replicating programs which can corrupt files and prevent the system from rebooting). **Spyware protection** – checks for and removes programs that record websites you visit and password you use. **Firewalls** – monitor traffic entering the computer system to block unauthorised access (from hackers).

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## Software

Explain the different aspects of utility software?

- Disk management – **Formatting** – prepares new media (e.g. a flash drive) for receiving data. **File Transfer** – copies files from one location to another (FTP used to copy across a network). **Defragmenter** – the memory on secondary storage (e.g. a hard disk drive) is divided into segments, but files are often larger than the size of a segment. So when files are saved, they are often split into 'blocks' across many segments. The defragmenter aims to bring these 'blocks' closer together making it quicker to access to the file.

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## Software

Explain the different aspects of utility software?

- **Maintenance** – **System Cleanup** - Searches for and deletes files/programs which are no longer used (*e.g. temporary files / installation files*). Deletes settings / registry values which are no longer used. **System Information** - Displays important data about the current state of the computer (e.g. temperature, free memory, network speed, % processor used). **Diagnosis** - Attempts to detect/resolve items that are not working correctly (e.g. missing drivers, network connection). **Automatic update** - Checks on the Internet for newer versions of programs which are installed (*from the software manufacturer's site*). If found it download / installs the software automatically.

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# Software

State 2 functions/purposes of an operating system

## **Memory Management**

Controls where the programs go in memory when being run.

## **User Interface**

Provides a method of interaction with the user.

## **MultiTasking**

Allows more than one program to run at once by sharing CPU time between programs.

## **Peripheral Management**

Manages all Input, Output and Storage devices.

## **Security**

Protects the machine is free from harmful viruses or unwanted access.

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## Software

How many types of software can you name?

**General purpose** – word processing/spreadsheet can create all types of documents

**Off the shelf** – Buy in shops/online – available, cheap, well documented – can pay more for features you don't need

**Bespoke** – custom made – exactly what you want, expensive, no general documentation/help, time to make

**Open source** – often free, code given, can edit/improve

**Closed source** – software source not given, cant edit/improve

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## Data Representation

Convert the following base 10 to binary

1. 34 - 00100010

2. 115 - 01110011

3. 99 - 01100011

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# Data Representation

Convert the following binary to base 10

1. 00010110 - 22

2. 01001001 - 73

3. 11001101 - 205

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# Data Representation

## Binary Addition?

101100  
111001 - 01100101

101111  
10011 - 01000010

1001101  
101011 - 01111000

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# Data Representation

Convert the following Hex to denary (base 10)

1. 3A - 58

2. AD - 173

3. 5E - 94

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# Data Representation

Convert the following base 10 to Hex

1. 91 - 5B

2. 169 - A9

3. 51 - 33

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# Data Representation

Convert the following binary to Hex

1. 10110110 - B6

2. 11001001 - C9

3. 10011011 - 9B

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# Data Representation

Convert the following Hex to binary

1. A5 - 10100101

2. 7D - 01111101

3. F3 - 11110011

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# Data Representation

How are images stored on a computer?

Images are stored in binary

What is meant by the term metadata?

Height, width, resolution, colour or bit depth

What factor affects the size of the image file?

The more pixels per inch the more data needs to be stored resulting in larger file size

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# Data Representation

What is the term used to convert analogue sound to digital?

**Sampling**

What would be the affect of low conversion?

**Few samples taken, poor quality, small file size**

What would be the affect of high conversion?

**More samples taken, good quality, large file size**

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# Database

What is a database?

A database is a persistent organised store of data on a computer system it is used to create, retrieve, update and delete data (CRUD)

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## Database

Data security is an issue. What methods could be put in place to protect data?

- Making regular backups
- Having a duplicate/mirror database server
- Storing backups in a safe place – “the cloud”
- Restricting access
- Keep audit trails of who has accessed data

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# Database

What is meant by the term validation?

Validation is the process of checking data when it is input. It checks for certain rules

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## Database

What is meant by the term data integrity?

That the data reflects reality. It implies that the data is accurate and correct and fit for purpose.

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## Database

What is meant by the term data redundancy?

Data is repeated unnecessarily generally occurs in flat file databases

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# Database

What is meant by the term entity?

Each table in a database contains information about an entity. It might be a customer, an invoice, an order etc.

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## Database

What is the difference between a flat file database and a relational database?

A flat file is made up of one single table where a relational database is multiple tables that are linked together so that related data can be easily extracted/queried

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## Database

What is a presence check?

**Must be filled in – Email address in online form**

What is a range check?

**Must fall between range – DOB for job application**

What is a format check?

**Must conform to pattern – Car reg/postcode**

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# Database

What is a DBMS?

Database Management System – software that maintains the database. It is a general purpose tool that allows database administrators to:

- Create database applications
- Protect data
- Run queries to extract data
- Keep data consistent
- Keep data accurate

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# Database

What is a primary key?

A primary key uniquely identifies a record

What is a record?

A row of data is a record

What is a field?

One cell in the table is a field

What is a foreign key

It is used to link tables together and create a relationship. It is a field in one table that is linked to the primary key in another table.

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# Database

What is a query?

A query is used to search and extract specific data

What is a form?

Provides graphical interface for input

What is a report?

Report is an output from the database usually used to summarise, group and select data. Often generated from a query

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# Database

ProductID	Description	Supplier	Quantity Left	Reorder Level	Discontinued	Price
0001	6 eggs	Hill Farm	50	20	FALSE	£0.98
0002	2 litres of milk	Hill Farm	17	20	TRUE	£1.20
0003	1kg apples	Killey's	42	50	FALSE	£0.79
0004	250g butter	Hill Farm	12	25	FALSE	£0.49
0005	500g Moku Flakes	Moku Foods	0	10	TRUE	£0.99
0006	6 salad tomatoes	Killey's	30	30	FALSE	£0.89
0007	580g can baked beans	Moku Foods	27	30	FALSE	£0.42
0008	Family tomato ketchup	Moku Foods	41	20	FALSE	£1.45

1. State the ProductID of the products in the above sample which fit the following criteria - Supplier=Killey's **0003, 0006**
2. Price>£1.00 OR Supplier = Hill Farm **0001, 0002, 0004, 0008**
3. Write the criteria which can be used to select all products which are not discontinued and where the QuantityLeft is lower than the RecorderLevel **Discontinued = False AND Quantity Left < Reorder Level**

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# Networking

What is a network?

A collection of connected computers

What is a LAN?

A local area network – e.g – school, office – 1 site

What is a WAN?

A wide area network – e.g covers a large geographical area. E.g lots of LAN's connected together

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# Networking

What is a NIC card?

A Network Interface Controller

A network interface card (NIC) is a computer circuit board or card that is installed in a computer so that it can be connected to a network.

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# Networking

What is a terminator?

A device connected to the end of a bus to prevent signals from bouncing back

What is a Router?

It receives data in the form of packets and forwards them to their destination – directs traffic

What is a Hub?

It connects many network devices together

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# Networking

What is the difference between a peer to peer network and a client server network?

## Peer To Peer

No single provider is responsible for being the server. Each computer stores files and acts as a server. Each computer has equal responsibility for providing data.

## Client Server

The client-server model is the relationship between two computers in which one, the client, makes a service request from another, the server. For example, websites are stored on **web servers**. A **web browser** is the client which makes a request to the server, and the server sends the website to the browser.

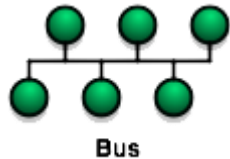
Challenge: To be able to extend on current computer science knowledge in preparation for exam

Aspire: To be able to build on computer science knowledge and apply this to the computer science exam

# Networking

Can you name three different network topologies?

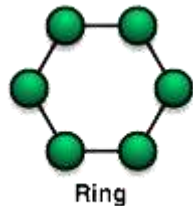
- Bus



- Star



- Ring



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## Networking

What is the acceptable use policy?

In a network it is important that everything is kept running as expected. Acceptable use policy is an agreement that a user would sign up to prior to using the network to say that they agree with the rules and regulations. – Like the school user policy you sign up to when you log on to the computer

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## Networking

What is the difference between the internet and the WWW?

The internet is a network of networks. All the networks connected together – mesh topology.

The WWW is made up of documents (webpages) that are (hyper)linked together “on top of” the internet.

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# Networking

Give 2 security measures used with networks

**Anti Virus Software** – Scans the system for viruses.

**Firewalls** – will block unexpected connections coming in to the network.

**Strong Passwords** – When more than one person uses a network it is important to have user IDs and passwords. Only someone with a login and password can access that network.

**Access Levels** – Different users have different access to parts of the network. Eg General Users will only be able to use software whereas higher users may be able to download software.

**Encryption** - Any message sent over a network can be intercepted. **Encryption** is a method of changing the original numbers and characters so that they are hidden or disguised. This is important if you are sending sensitive information.

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## Networking

- What does HTML stand for and what are its uses?

### **HyperText Mark-up Language**

The language used to write and display web page documents.

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# Networking

What is the difference between lossy and lossless compression?

## **LossLess Compression**

When the data is compressed it does not lose data and the original file is reconstructed exactly. E.g. compressed text files.

## **Lossy Compression**

When the data is compressed some of the data is removed and cannot be recovered. The more the image is compressed the less detail will be visible – quality is lost

E.g. music files(mp3), large resolution images for displaying on small screens.

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## Networking

What does DNS stand for and how is it used?

**DNS servers** have a database of IP addresses  
Constantly updated by other DNS servers  
When you request an address(URL), the DNS server looks up the URL and returns the IP address, or searches for the address from other DNS servers

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# Networking

What are the advantages of DNS?

- People do not need to remember IP addresses
- Easily upgradable (eg IPv4 to IPv6) without all web addresses needing to be the same
- As long as you are connected to a DNS server you can have access to all the addresses

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# Networking

Can you give 2 advantages of a network

- Shared resources/software
- Collaborative working
- Centralised databases
- Communication
- Shared devices
- Security

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# Networking

Can you give 2 disadvantages of a network

- Need expertise to set up
- Can be expensive
- Security – unauthorised access

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