The need for primary storage:

Types of storage:

- Primary storage
- Secondary storage

Primary storage:

- All are volatile except ROM
- ROM is read only
- They have a small storage capacity
- Very fast access times

Secondary storage:

- Non volatile
- Large storage capacity
- Very slow access times

RAM and ROM:

ROM:

- Read only
- Non volatile
- Contains bootstrap (initial instructions for the computer)

- Smaller than RAM

RAM:

- Volatile
- Temporary storage of instructions and data
- More faster than hard disk
- Larger than ROM
- Read and write

When the computer is loaded up, the ROM gives the computer the initial instructions and then the CPU looks into the hard disk and transfers the operating system to the RAM.

Virtual memory:

When there is not enough physical space on the RAM, virtual memory is used by the programs which are not being used on the RAM are transferred onto the hard disk into virtual memory.

When that program is needed again, it will be transferred back into the RAM and another program will be transferred into the virtual memory

The need for secondary storage:

What happens when you turn your computer on:

1. CPU gets it's initial instructions from the ROM (bootstrap)
2. Operating systems and other things stored on the secondary storage is transferred onto RAM

When the computer is powered off, the programs and data and operating system is all transferred to secondary storage because it is non volatile and is read and write

Common types of storage:

Drive is the device that reads and writes data from secondary storage

Media is what device it is stored on

Optical storage:

- CDR/W
- CDR
- DVDR
- DVDR/W

- Blu-ray (more storage)

How optical drives work:

- Shines a laser at the media and processes a reflection of the media
- For read only drives, the surface of the disk is burnt by the laser which then creates pits and lands which can be stored as binary
- For read and write, chemical reactions which can be reserved happen

Advantages	Disadvantages
Cheap	Slow access times
Light weight	Prone to scratches
Portable	

Magnetic storage:

It uses magnets and has a drive head which moves over the surface of the disk which means that it can eventually fail

Advantages	Disadvantages
Cheap	Slow access times

Large capacity	Fragile

Solid state storage:

How it works:

- Flow of electricity forces electrons into floating gates between two oxide layers
- This then changes the charge in the floating gate and then can be measured as a zero or a one

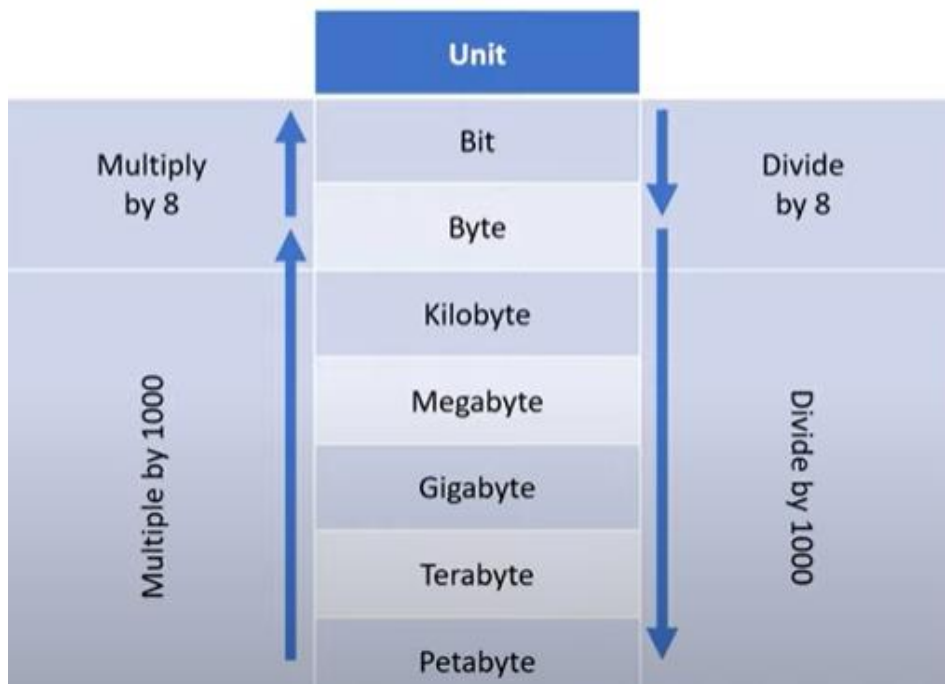| Advantages	Disadvantages
Durable	Expensive
Fast access times	Limited read/writes

Suitable storage devices and storage media:

When deciding on which storage device to use:

- Cost
- Speed
- Portability
- Durability
- Reliability
- Capacity

The units of data storage:

	Unit	
Multiply by 8	Bit	Divide by 8
	Byte	
Multiple by 1000	Kilobyte	Divide by 1000
	Megabyte	
	Gigabyte	
	Terabyte	
	Petabyte	

Computers have just two states, 0 & 1

This makes it more cheaper, easier to manufacture and more reliable

Calculating file sizes:

Multiply everything apart from metadata in the question.

Metadata is additional information about the data.

Converting between denary and binary:

89-64 = 25-16 = 9-8 = 1

128	64	32	16	8	4	2	1
0	1	0	1	1	0	0	1

Binary to denary:

128	64	32	16	8	4	2	1
0	1	1	0	0	1	1	0
	64 +	32 +			+ 4	+ 2	

Adding 8 bit binary integers:

0 + 0 = 0

0 +1 = 1

1 + 1 = 0 and carry 1

1 + 1 + 1 = 1 and carry 1

Write overflows in exam

Number line	128	64	32	16	8	4	2	1	Denary
Number	0	1	0	1	1	1	1	1	95
Number	1	1	0	1	1	1	1	0	222
Answer	0	0	1	1	1	1	0	1	317
Carries	1		1	1	1	1			

1 ← Overflow

Converting between denary and 2 digit hexadecimal:

Denary	MSB			12				LSB
Binary	128	64	32	16	8	4	2	1
Nibble	8	4	2	1	8	4	2	1
Hexadecimal								

Most Significant Bit

Least Significant

Denary				230				
Binary	128	64	32	16	8	4	2	1
	1	1	1	0	0	1	1	0
Nibble	8	4	2	1	8	4	2	1
Hexadecimal	E				6			

Denary								
Binary	128	64	32	16	8	4	2	1
	1	0	1	0	1	0	1	1
Nibble	8	4	2	1	8	4	2	1
Hexadecimal	A				B = 11			

Binary shifts:

When we perform left binary shifts, it multiplies the denary value by 2

When we perform right binary shifts, it divides the denary value by 2

Representing character sets:

A character set is a defined list of characters recognised by the computer hardware and software.

Character sets are a standard.

ASCII stands for American Standard Code Information Interchange and had 7 bit character set and could only provide for the English language with 128.

Extended ASCII which could provide for some foreign languages and had 8 bit character set with 256.

Unicode can provide for all languages, historical languages and emojis. It is a 24 bit character set with 16 million.

Representing images:

Bitmap images are made up of pixels

Each colour has different binary values

Metadata can represent image height, width, colour depth and colour palette.

Resolution is the amount of pixels which make up your screen

Representing sound:

Sound goes from an analogue signal to a digital signal when being converted for a computer

Things which affect the quality of sound:

- Sample rate – The number of samples per second
- Bit depth – Amount of detail for each sample

The higher the sample rate, the higher the quality of the sound file and the larger the file size

The more bit depth, the more quality and the larger file size

Intervals is the number of pauses

Total range of numbers is the bandwidth

Compression:

Compression reduces the file size so it take up less storage

More quicker transfer over the internet

Different compression techniques:

- Lossy compression – Reduces file size significantly but deletes data
- Lossless compression – Reduces file size by very little but doesn't delete any data

Suitability for compression:

- Codes and text need lossless
- Images and sound need lossy