OCR Computer Science GCSE
1.2 - Memory and Storage

Flashcards

Why do computers have primary storage (memory)?

Why do computers have primary storage (memory)?

To provide fast access to data, instructions and software currently in use by the CPU.

What does primary storage usually consist of?

What does primary storage usually consist of?

RAM and ROM.

What does it mean for memory to be volatile?

What does it mean for memory to be volatile?

Its contents are lost when the computer loses power.

What is stored in the Random Access Memory (RAM)?

What is stored in the Random Access Memory (RAM)?

The data and instructions that the computer is currently working with.

Is the Random Access Memory (RAM) volatile or non-volatile?

Is the Random Access Memory (RAM) volatile or non-volatile?

Volatile.

What is stored in the Read-Only Memory (ROM)?

What is stored in the Read-Only Memory (ROM)?

Firmware that is essential for the computer to boot up and operate.

True or false: the ROM's contents can be modified during normal operation

True or false: the ROM's contents can be modified during normal operation

False.

Is the Read-Only Memory (ROM) volatile or non-volatile?

Is the Read-Only Memory (ROM) volatile or non-volatile?

Non-volatile

Why might virtual memory be needed in a system?

Why might virtual memory be needed in a system?

When a computer's RAM is full and there are still more programs or data that need to be loaded.

How does virtual memory work?

How does virtual memory work?

The system uses part of the secondary storage (such as a hard drive or SSD) as if it were extra RAM.

What is stored in the cache?

What is stored in the cache?

Frequently used data/instructions.

Name three types of secondary storage.

Name three types of secondary storage.

Solid-state, optical, and magnetic.

How do Solid State Drives (SSDs) store data?

How do Solid State Drives (SSDs) store data?

Using electrical circuits (with no moving parts) that trap an electrical charge.

How do optical disks store data?

How do optical disks store data?

In a form such as a CD or DVD that can be read optically by a laser.

How do magnetic hard disks store data?

How do magnetic hard disks store data?

Using many, tiny magnetised regions.

Rank the three secondary storage types from highest to lowest capacity.

Rank the three secondary storage types from highest to lowest capacity.

Hard-disk drive (high capacity)

Solid-state drive (relatively low capacity)

Optical disk (very low capacity)

Rank the three secondary storage types from highest to lowest speed.

Rank the three secondary storage types from highest to lowest speed.

Solid-state drive (very high speeds)

Hard-disk drive (good speeds)

Optical disk (relatively low speeds)

Rank the three secondary storage types from best to worst portability.

Rank the three secondary storage types from best to worst portability.

Solid-state drive (lightweight and rarely damaged by movement)

Optical disk (Very small and lightweight, can be damaged by scratches and dirt)

Hard-disk drive (bulky, heavy and easily damaged by movement)

Rank the three secondary storage types from most to least durable.

Rank the three secondary storage types from most to least durable.

Solid-state drive (no moving parts, very durable)

Hard-disk drive (contains moving parts, prone to damage)

Optical disk (easily scratched or damaged)

Rank the three secondary storage types from most to least reliable.

Rank the three secondary storage types from most to least reliable.

Solid-state drive (very reliable)

Hard-disk drive (fairly reliable but degrades over time)

Optical disk (less reliable - damage affects data easily)

Rank the three secondary storage types from cheapest to most expensive per GB.

Rank the three secondary storage types from cheapest to most expensive per GB.

Hard-disk drive

Optical disk

Solid-state drive

Give two use cases for hard-disk drives.

Give two use cases for hard-disk drives.

Desktop PCs and servers.

Give three use cases for solid-state drives.

Give three use cases for solid-state drives.

Laptops, phones and tablets.

Give a use case for optical disks.

Give a use case for optical disks.

Sharing and distributing small volumes of data.

Why must data in computer systems be stored in binary format?

Why must data in computer systems be stored in binary format?

Because it has only two states, 0 or 1, which map directly to the two states of electronic components like transistors: on (1) or off (0).

List the units of data storage with their relative sizes.

List the units of data storage with their relative sizes.

- Bit
- Nibble (4 bits)
- Byte (8 bits)
- Kilobyte (1,000 bytes or 1 KB)
- Megabyte (1,000 KB)
- Gigabyte (1,000 MB)
- Terabyte (1,000 GB)
- Petabyte (1,000 TB)

What is the fundamental unit of information?

What is the fundamental unit of information?

A bit.

What does "bit" stand for?

What does "bit" stand for?

Binary digit.

How many bits are in a byte?

How many bits are in a byte?

8 bits.

What is the symbol for a bit?

What is the symbol for a bit?

A lowercase b.

What is the symbol for a byte?

What is the symbol for a byte?

An uppercase B.

What is a kilobyte (kB) equal to?

What is a kilobyte (kB) equal to?

1,000 bytes.

What is a megabyte (MB) equal to?

What is a megabyte (MB) equal to?

1,000 kilobytes (1,000,000 bytes).

What is a gigabyte (GB) equal to?

What is a gigabyte (GB) equal to?

1,000 megabytes.

What is a terabyte (TB) equal to?

What is a terabyte (TB) equal to?

1,000 gigabytes.

What is a petabyte (PB) equal to?

What is a petabyte (TB) equal to?

1,000 terabytes.

What is the correct order of units from smallest to largest?

What is the correct order of units from smallest to largest?

Bit → Byte → Kilobyte → Megabyte → Gigabyte → Terabyte → Petabyte

What is the difference between b and B?

What is the difference between b and B?

b = bit, B = byte (capitalisation matters!)

How many bytes are there in 3 MB?

How many bytes are there in 3 MB?

3,000,000 bytes.

How do you convert denary to binary?

How do you convert denary to binary?

1. Write out place value headers, starting with one and increasing in powers of two, placing larger values to the left of smaller values.
2. Starting from the left hand side, you place a one if the value is less than or equal to your number, and a zero otherwise.
3. Once you've placed a one, you must subtract the value of that position from your number and continue as before, until your number becomes 0.

What is the 8-bit binary equivalent of the denary number 13?

What is the 8-bit binary equivalent of the denary number 13?

00001101

How do you convert binary to denary?

How do you convert binary to denary?

1. Write out place value headers, starting with one and increasing in powers of two, placing larger values to the left of smaller values.
2. Align the left of the binary number with the place value headers.
3. Add together all of the place values with a binary 1 beneath them.

What is the denary equivalent of the binary number 1010?

What is the denary equivalent of the binary number 1010?

8 (2^3)	4 (2^2)	2 (2^1)	1 (2^0)
1	0	1	0

$$8 + 0 + 2 + 0 = 10$$

How do you convert binary to hexadecimal?

How do you convert binary to hexadecimal?

- Split the 8-bit binary value into two 4-bit nibbles and convert each to denary.
- Once each nibble has been converted to denary, the denary value can be converted to its hexadecimal equivalent (0-9 remain the same, A=10, B=11, …, F=15)
- Finally, the hexadecimal digits are concatenated to form a hexadecimal representation.

What is the hexadecimal equivalent of the binary number 11011111?

What is the hexadecimal equivalent of the binary number 11011111?

1101 1111 → D F

How do you convert hexadecimal to binary?

How do you convert hexadecimal to binary?

Convert each hexadecimal digit to a denary digit and then to a binary nibble before combining the nibbles to form a single binary number.

What is the binary equivalent of the hexadecimal number A7?

What is the binary equivalent of the hexadecimal number A7?

10100111 (A=1010, 7=0111)

How do you convert denary to hexadecimal?

How do you convert denary to hexadecimal?

1. Convert the denary number into binary
2. Convert this binary number to hexadecimal (as shown previously)

What is the hexadecimal equivalent of the denary number 254?

What is the hexadecimal equivalent of the denary number 254?

FE

How do you convert hexadecimal to denary?

How do you convert hexadecimal to denary?

1. Begin by converting the hexadecimal number into binary (as two nibbles that you then concatenate)
2. Convert this binary number to denary.

What is the denary equivalent of the hexadecimal number 2F?

What is the denary equivalent of the hexadecimal number 2F?

$(2 \times 16) + 15 = 47$

What is the binary value of hex F?

What is the binary value of hex F?

1111

What is the result of 0 + 0 in binary?

What is the result of 0 + 0 in binary?

0

What is the result of 1 + 0 in binary?

What is the result of 0 + 0 in binary?

1 with a carry of 0

What is the result of 1 + 1 in binary?

What is the result of 1 + 1 in binary?

0 with a carry of 1

What is the result of 1 + 1 + 1 in binary?

What is the result of 1 + 1 + 1 in binary?

1 with a carry of 1

What is a binary shift?

What is a binary shift?

Moving the bits of a binary number left or right.

What does a left binary shift do?

What does a left binary shift do?

Multiplies the number by 2 for each place shifted.

Which side are 0s added to in a left binary shift?

Which side are 0s added to in a left binary shift?

To the right.

What does a right binary shift do?

What does a right binary shift do?

Divides the number by 2 for each place shifted.

Which side are 0s added to in a right binary shift?

Which side are 0s added to in a right binary shift?

To the left.

Shift 00101100 left by 1.
What is the result?

Shift 00101100 left by 1. What is the result?

01011000 (44 → 88)

Define most significant bit.

Define most significant bit.

The bit with the highest value.

How can you identify the most significant bit in a binary number?

How can you identify the most significant bit in a binary number?

The most significant bit is the leftmost 1 in a binary number.

Define least significant bit.

Define least significant bit.

The bit with the lowest value.

How can you identify the least significant bit in a binary number?

How can you identify the least significant bit in a binary number?

The least significant bit is the rightmost bit, whether it is a 0 or 1, in a binary number.

True or false: adding additional 0s to the left of a binary number changes its value.

True or false: adding additional 0s to the left of a binary number changes its value.

False. E.g. 11010 is the same as 00011010.

What is character encoding?

What is character encoding?

The process of converting characters into binary codes so they can be stored and processed by a computer's hardware.

Why is character encoding necessary?

Why is character encoding necessary?

Because computers can only store and process binary data.

What is a character set?

What is a character set?

A collection of characters and their corresponding binary codes.

Name two character sets.

Name two character sets.

ASCII and Unicode.

ASCII ‘A’ is coded as 65. Using this, determine what ASCII ‘E’ is coded as.

ASCII ‘A’ is coded as 65. Using this, determine what ASCII ‘E’ is coded as.

A = 65

B = 66

C = 67

D = 68

E = 69

State the equation to calculate text file size.

State the equation to calculate text file size.

text file size = bits per character x number of characters

What is a pixel?

What is a pixel?

Short for “picture element” - a single point in an image.

How are images represented in a computer?

How are images represented in a computer?

As a series of pixels, with each pixel's colour value stored in binary.

What is image metadata?

What is image metadata?

Data about an image such as: file format, resolution, colour depth, and sometimes details like the device used to capture the image.

What is colour depth?

What is colour depth?

The number of bits used to represent each pixel.

How many unique colours can be represented by 1-bit colour depth?

How many colours can 1-bit colour depth represent?

2^1 = 2 colours (typically black and white)

How many unique colours can be represented by 8-bit colour depth?

How many unique colours can be represented by 8-bit colour depth?

$2^8 = 256$ colours

What happens to an image's file size if colour depth increases?

What happens to an image's file size if colour depth increases?

File size increases, as more bits per pixel = more data.

What happens to an image's quality if colour depth increases?

What happens to an image's quality if colour depth increases?

Quality improves, as a wider range of colours can be represented.

What is resolution?

What is resolution?

Resolution is the number of pixels within an image. It can be found by multiplying the image width in pixels by the image height in pixels.

State the equation to calculate image file size.

State the equation to calculate image file size.

image file size = colour depth x image height (px) x image width (px)

How is sound represented in a computer?

How is sound represented in a computer?

By sampling: measuring the analogue wave's amplitude at regular intervals and storing it in binary.

What is the sample rate?

What is the sample rate?

The number of samples taken per second, measured in Hertz (Hz).

What is sound bit depth?

What is sound bit depth?

The number of bits used to store each sample - determining how accurate and precise each sample is.

What is the effect of increasing the sample rate?

What is the effect of increasing the sample rate?

Improves audio quality but also increases file size.

What is the effect of increasing the bit depth?

What is the effect of increasing the bit depth?

Provides more accurate sound (better quality), but increases file size.

State the equation to calculate sound file size.

State the equation to calculate sound file size.

sound file size = sample rate x duration (s) x bit depth

What is data compression?

What is data compression?

Data compression is the process of reducing the file size of digital data without losing the original information (or with minimal acceptable loss).

Why is data compression used?

Why is data compression used?

To save storage space, speed up file transfer, reduce bandwidth usage, and enable faster downloads and streaming.

What are the two main types of compression?

What are the two main types of compression?

Lossy and lossless.

What is lossy compression?

What is lossy compression?

Compression that removes some data permanently, reducing file size more but lowering quality.

Is lossy compression reversible?

Is lossy compression reversible?

No - original data cannot be fully recovered.

What is lossless compression?

What is lossless compression?

Compression that preserves all data, allowing the original file to be perfectly reconstructed.

What is a benefit of lossy compression?

What is a benefit of lossy compression?

Significantly reduces file sizes for faster transmission.

What is a drawback of lossy compression?

What is a drawback of lossy compression?

Some quality is lost, and the file cannot be restored exactly.

What is a benefit of lossless compression?

What is a benefit of lossless compression?

No data is lost - original quality and content are fully preserved.

What is a drawback of lossless compression?

What is a drawback of lossless compression?

File sizes are larger than with lossy compression.

Which compression type is best for compressing text or code?

Which compression type is best for compressing text or code?

Lossless, data cannot be removed permanently; the text or code would become unusable.

Which compression type is better for streaming music or video?

Which compression type is better for streaming music or video?

Lossy, removing some data will allow for better transfer speeds, meaning the music or video will buffer less.