

GCSE OCR

Computer Science
J277

Memory

Unit 1
Systems architecture



PG ONLINE

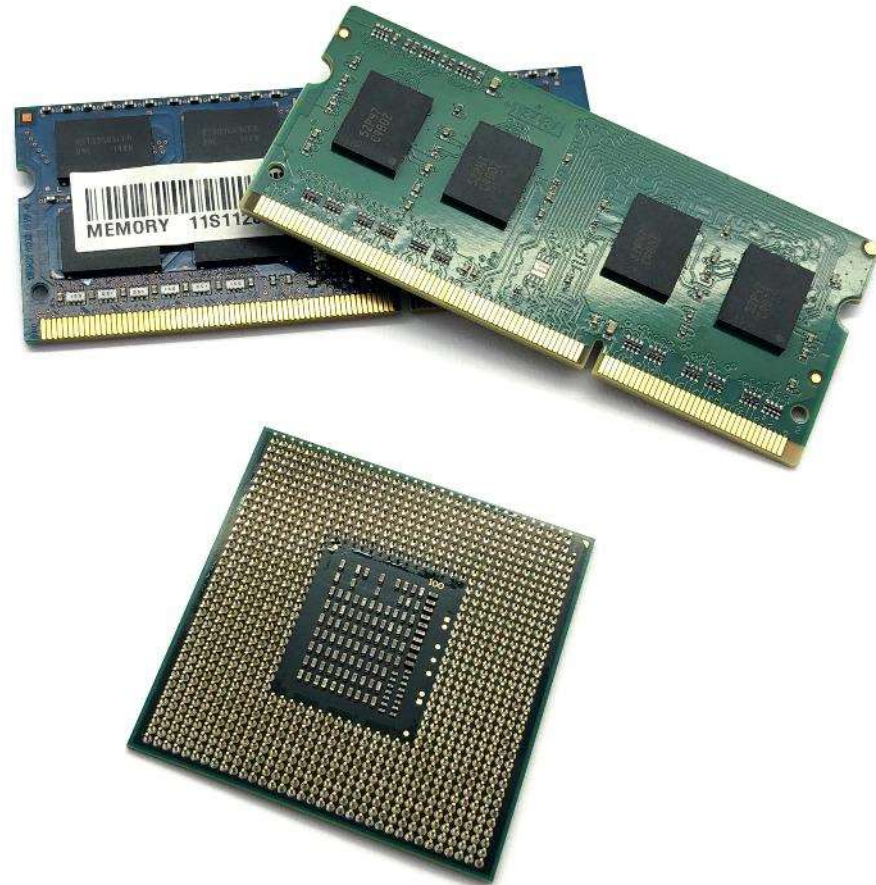
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Objectives

- Explain the need for primary storage
- Describe the difference between RAM and ROM
- Describe the purpose of RAM and ROM in a computer system
- Explain the need for virtual memory

Starter

- What are **four** types of memory that are used in computers systems?



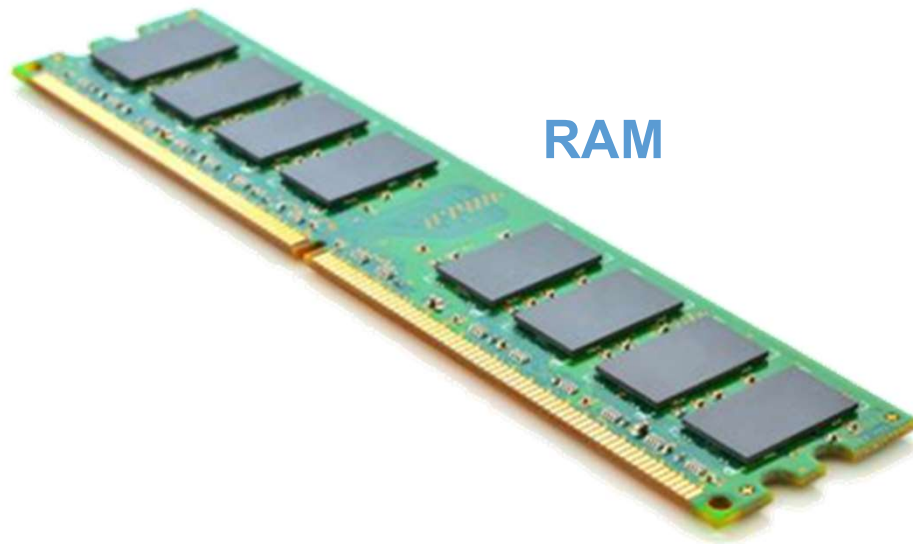
Starter

Answers

- From previous lessons:
 - CPU registers
 - Cache
- This lesson:
 - RAM
 - ROM
 - Virtual memory

Types of primary storage

- There are many types of memory used in computers
- The two types used as primary storage are:
 - **RAM** (Random Access Memory)
 - **ROM** (Read Only Memory)



RAM

ROM



RAM

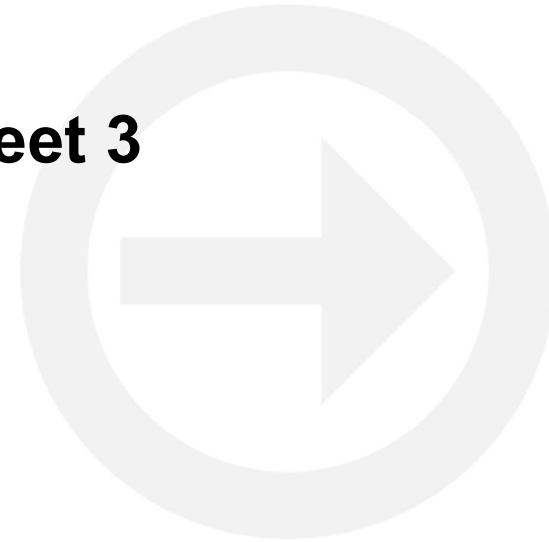
- RAM is often referred to as:
 - main memory, primary memory, primary storage
- It can be read from and written to
 - Access to RAM is much faster than a hard drive
 - The name Random Access Memory comes from the ability of the CPU to access any part of the memory in the same amount of time
- At any one time it will normally store:
 - The operating system (or part currently in use)
 - The software currently in use
 - The data which the software is using

RAM

- The computer stores running programs and data in RAM when your computer is turned on
- When your computer is turned off, data store in RAM is lost
 - RAM is volatile as it loses data if the power is off
- All your programs and data are stored permanently on your hard drive
 - This is known as non-volatile storage as it doesn't lose the data if the power is off

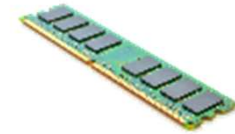
Worksheet 3

- Complete **Task 1** on **Worksheet 3**

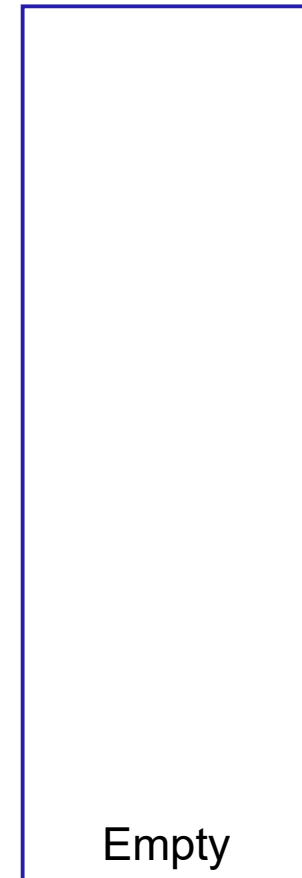


RAM

- When the computer is first turned on, no data is stored in RAM



RAM

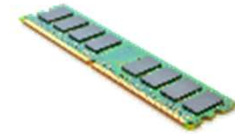


Empty

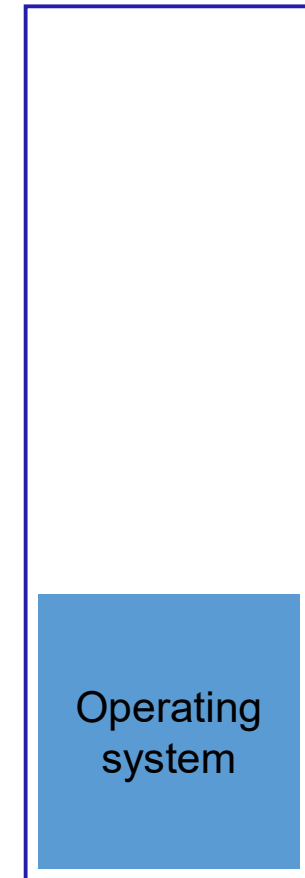


Operating system

- The computer first loads the operating system from your hard drive into RAM

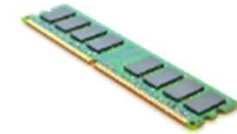


RAM

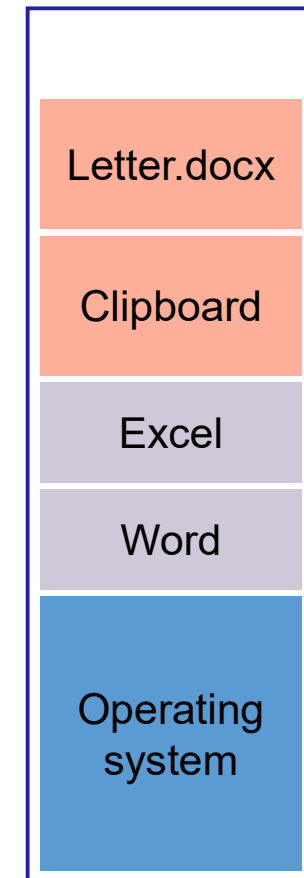


Programs and data

- When applications or programs are loaded, they are copied into RAM from the hard drive
 - Documents and files (data) that are used with those programs are also opened by copying them into RAM
- RAM starts to fill up as all these programs, documents and files are copied

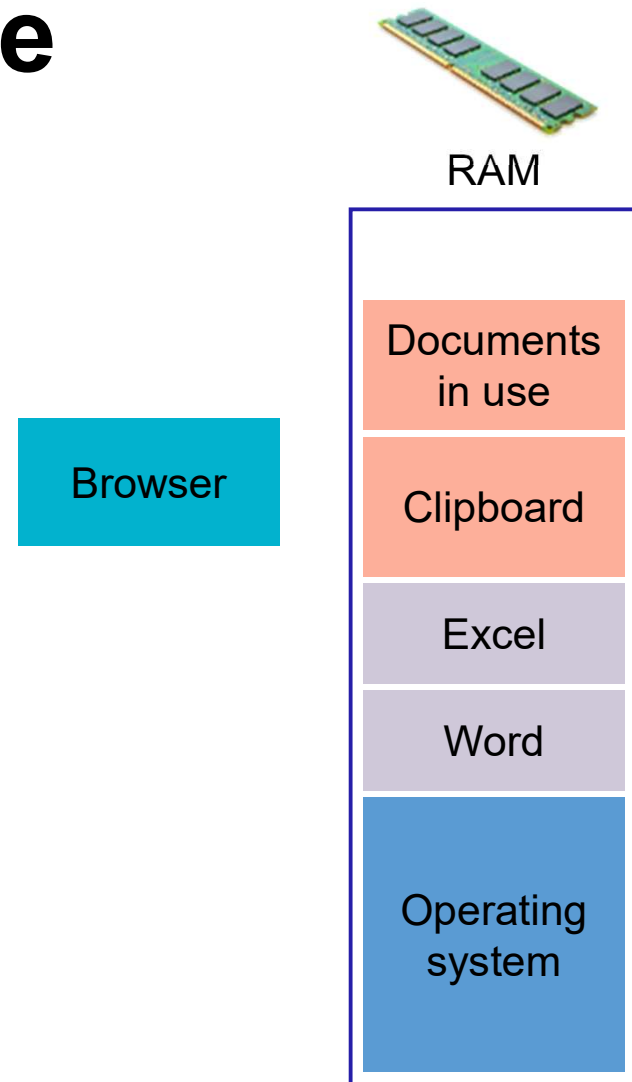


RAM



Running out of space

- You now want to open a browser to search the Internet
- The browser software needs more memory than you have free in RAM
 - What do you think happens?

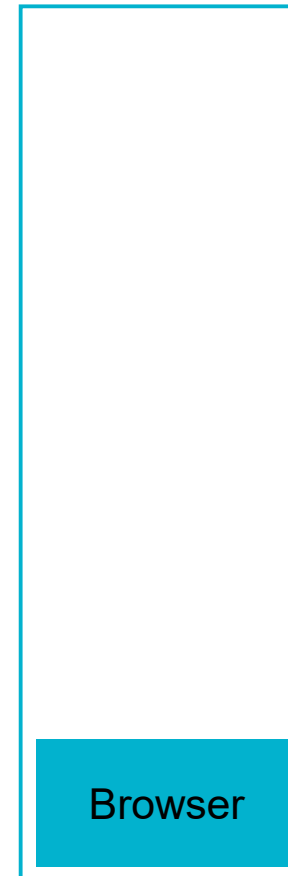


Virtual memory

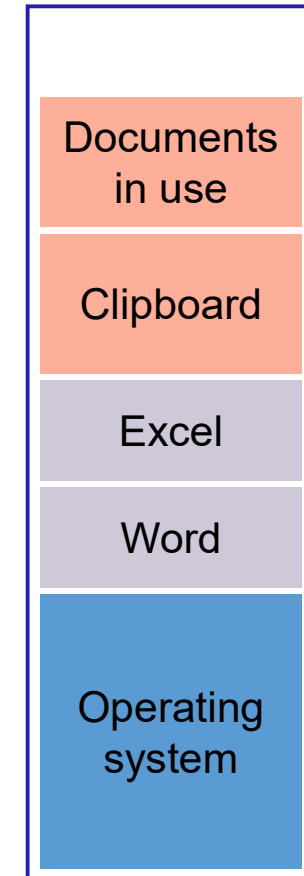
- Virtual memory is part of the hard drive used as an extension to RAM
 - What are the advantages and disadvantages of using part of the hard disk in this way?



Hard Disk



RAM



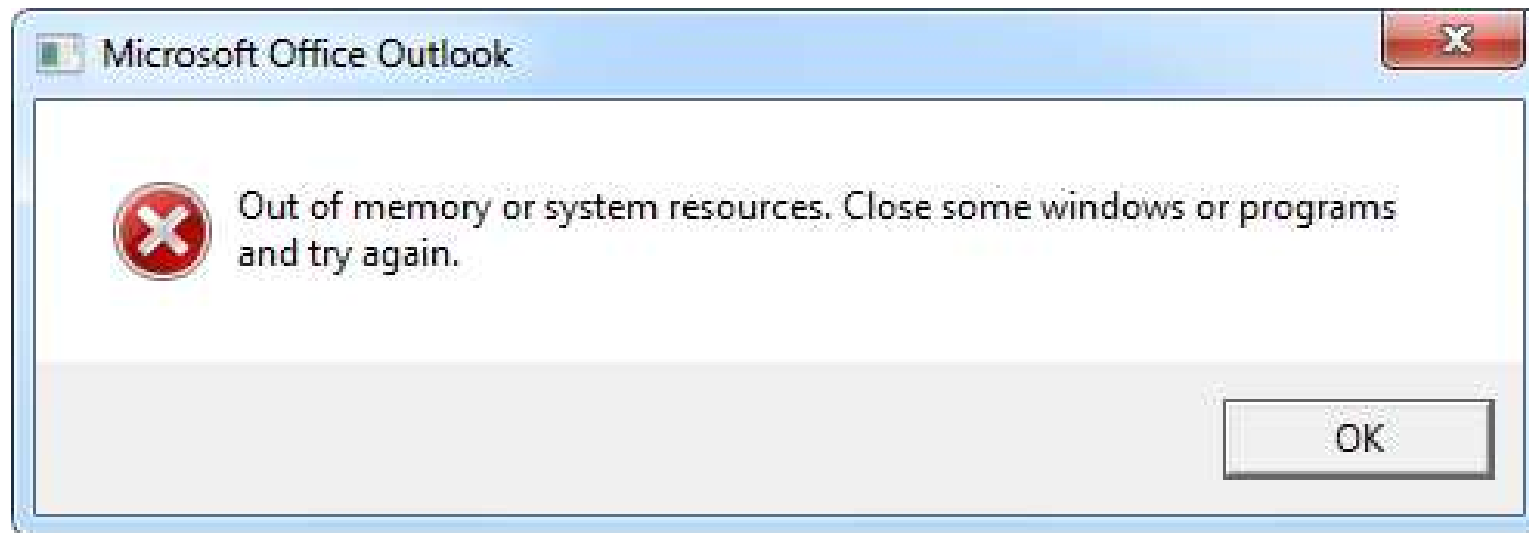
Virtual memory

Answers

- Advantages
 - Uses cheap secondary storage on the hard drive
 - Prevents error messages saying 'out of memory' – the programs and files will still open
- Disadvantages
 - Accessing virtual memory is very slow
 - To access data, the existing data in RAM needs to be copied to the virtual memory, then data in virtual memory needs to be copied to RAM

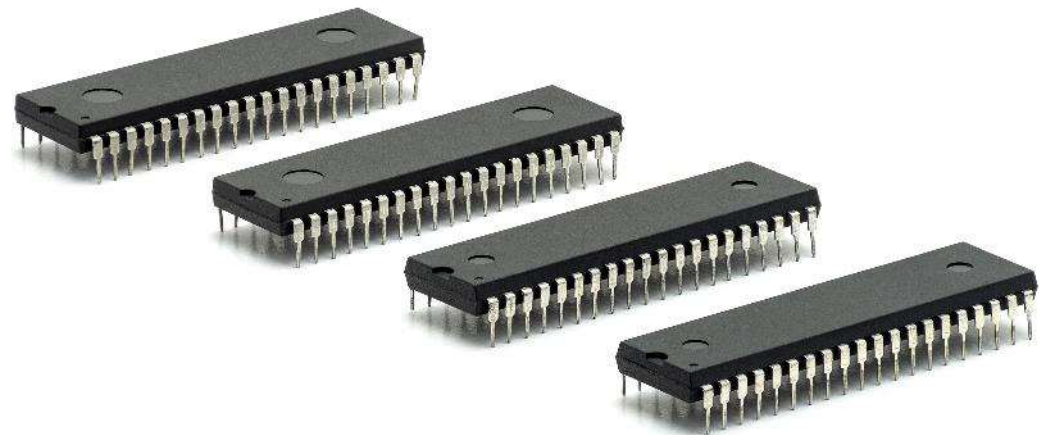


What happens when RAM completely fills up?



Read-only memory (ROM)

- Some data needs to be permanently held in primary storage, even when a computer has no power
 - Read-only memory (ROM) is used to store this data
 - Data is read from ROM, but cannot be written to it
 - It is non-volatile as the data isn't lost if the power is off
- What is stored in ROM on a modern computer?



ROM

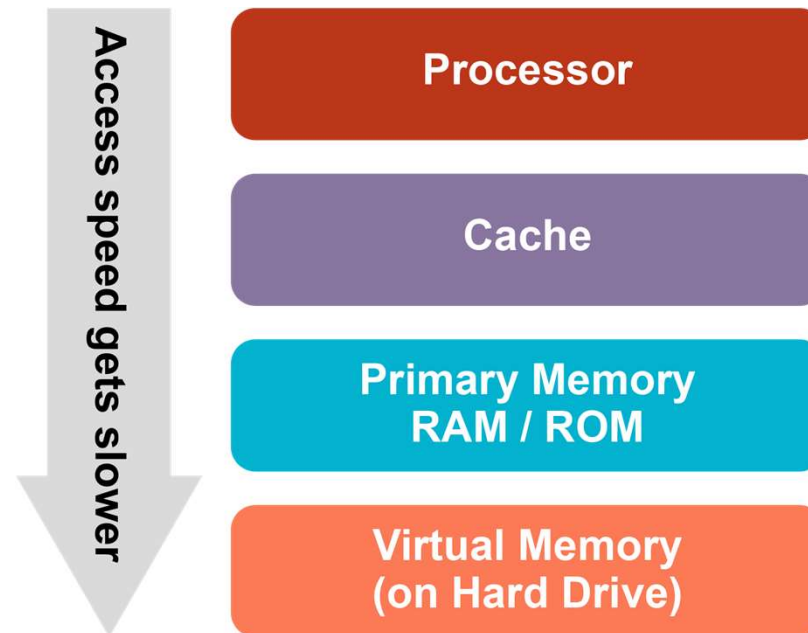
Answers

- ROM is used in modern computers to store:
 - The initial program that is run when the computer is turned on
 - This is known as the bootstrap
 - It tells the computer where it will find the operating system on the hard drive
- It also stores the Basic Input/Output System (BIOS)
 - The BIOS can run without a hard drive or other secondary storage being present
 - It controls basic technical configuration of the computer such as the processor speed and system time



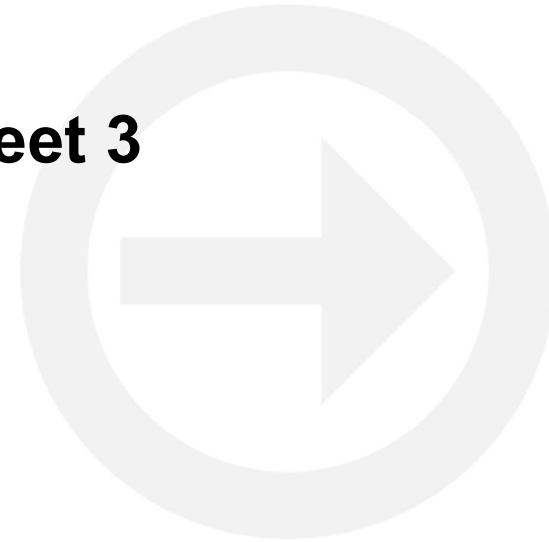
Memory speed

- The speed that data can be accessed changes through the different components in a computer
 - The slower components are far cheaper for each byte of data stored



Worksheet 3

- Complete **Task 2** on **Worksheet 3**



Plenary

- In pairs test each other on the following:
 1. What does RAM stand for?
 2. What does ROM stand for?
 3. Name one difference between RAM and ROM
 4. How much RAM is typically available in a modern personal computer?
 5. Why is virtual memory much slower than RAM?

Plenary

Answers

- RAM stands for Random Access Memory
- ROM stands for Read Only Memory
- RAM can be written to, ROM can't
ROM is non-volatile, RAM is volatile
- Typically, a modern personal computer will have 8-32 GB of RAM available



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