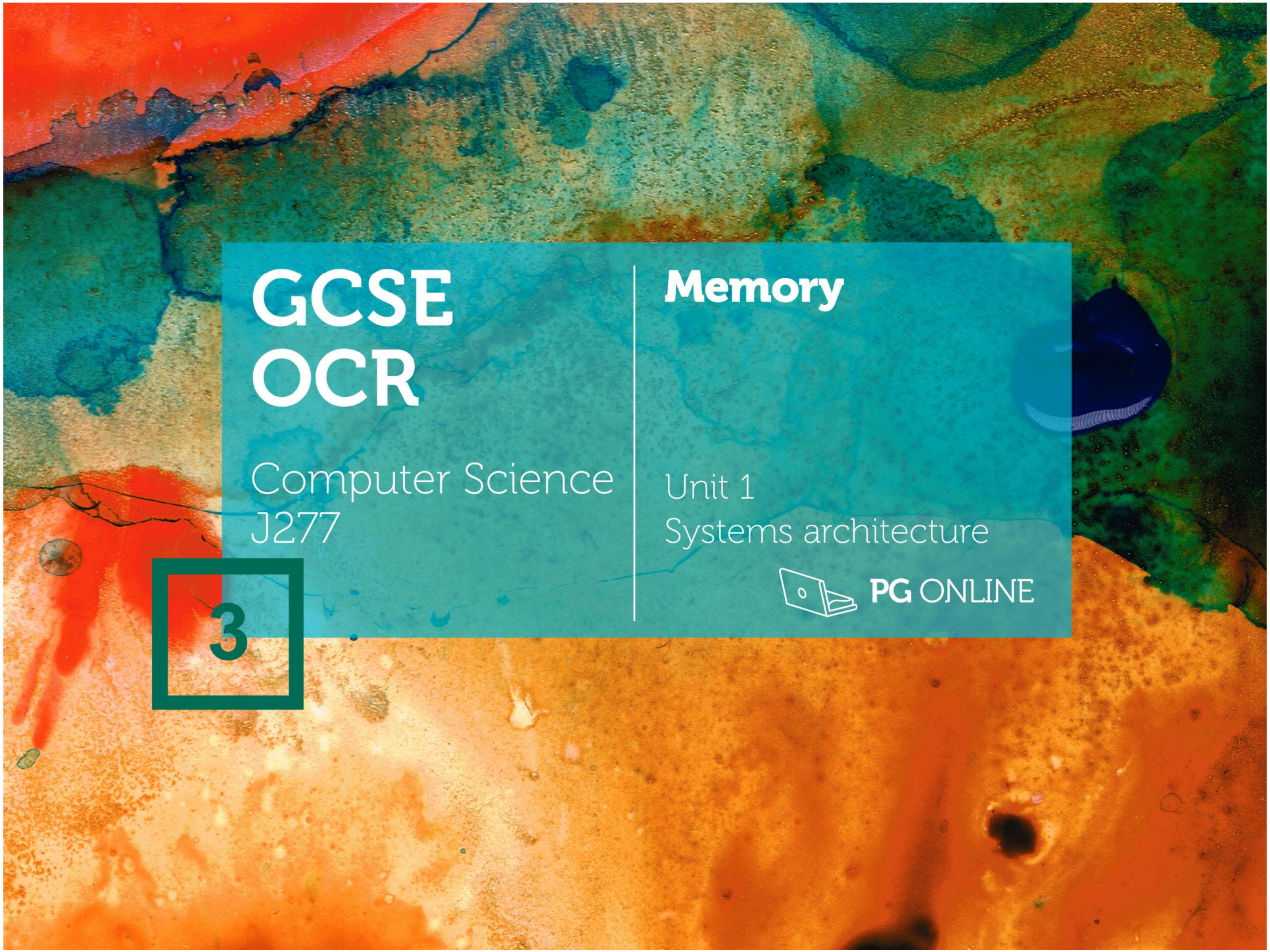
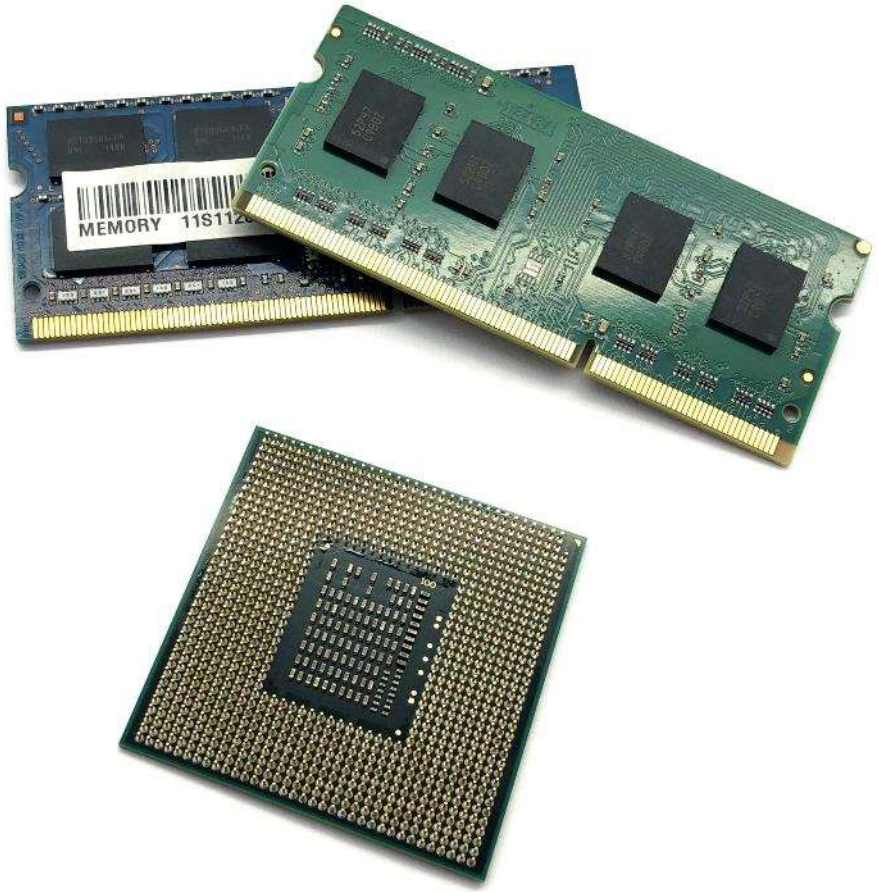

GCSE
OCR
Computer Science
J277
3
Memory
Unit 1
Systems architecture
PG ONLINE

# 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?



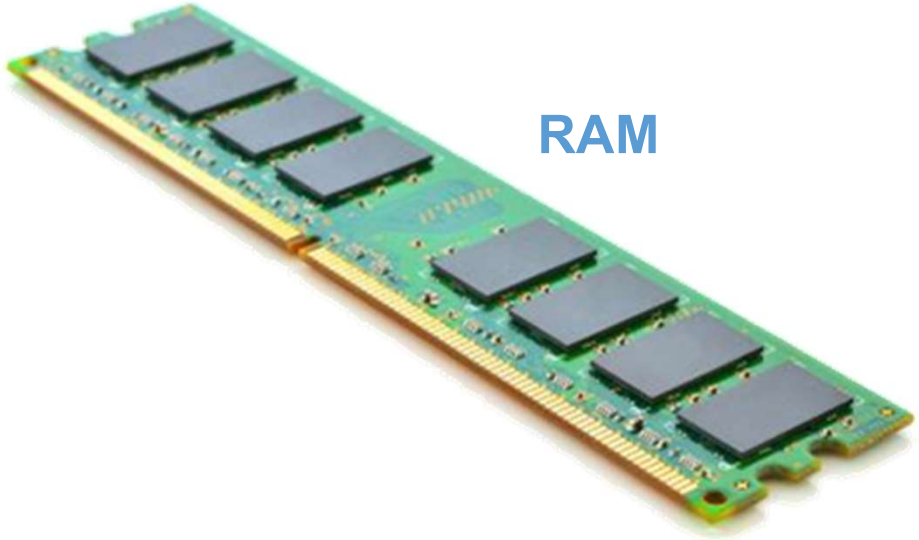
# Starter

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** (**R**andom **A**ccess **M**emory)
  - **ROM** (**R**ead **O**nly **M**emory)



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

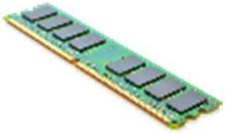
- The computer stores running programs and data in RAM when your computer is turned on
- When your computer is turned off, data store in RAM is lost
  - RAM is volatile as it loses data if the power is off
- All your programs and data are stored permanently on your hard drive
  - This is known as non-volatile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

# Worksheet 3

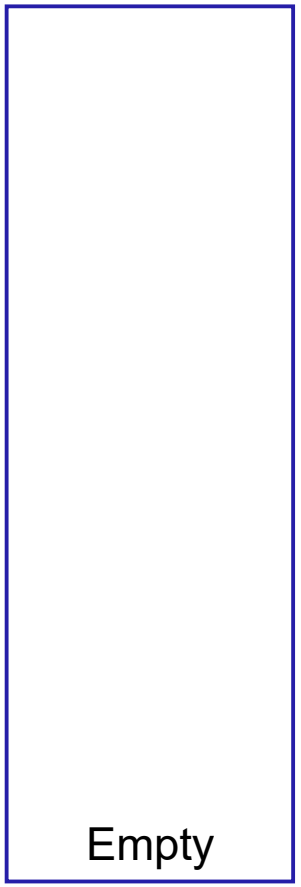
- Complete **Task 1** on **Worksheet 3**

# RAM

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

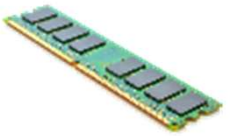


RAM

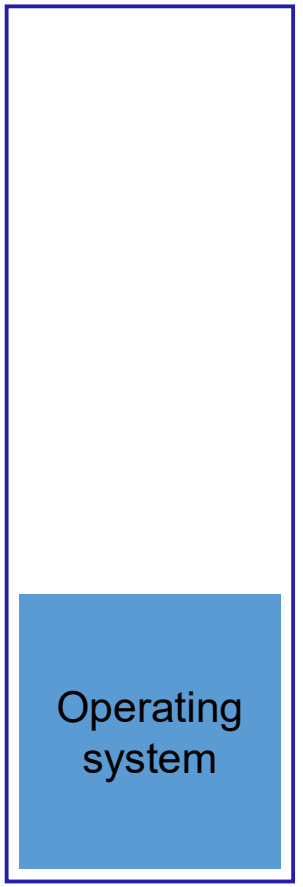


# Operating system

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



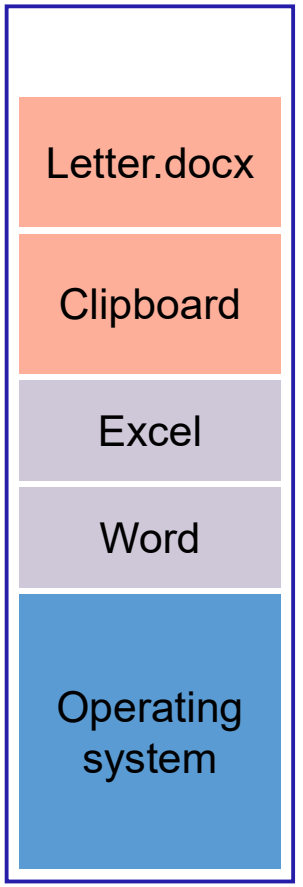
RAM



# 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

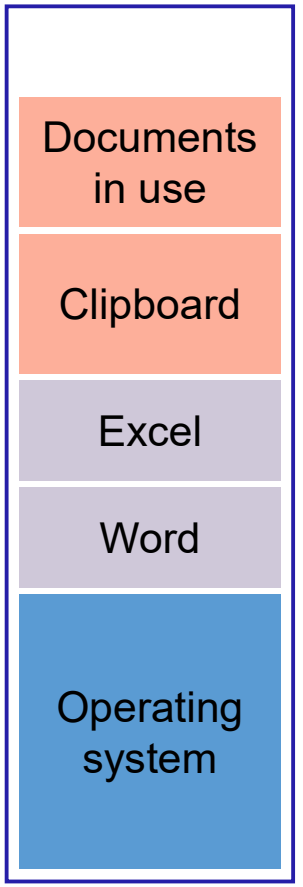


# Running out of space

- 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?

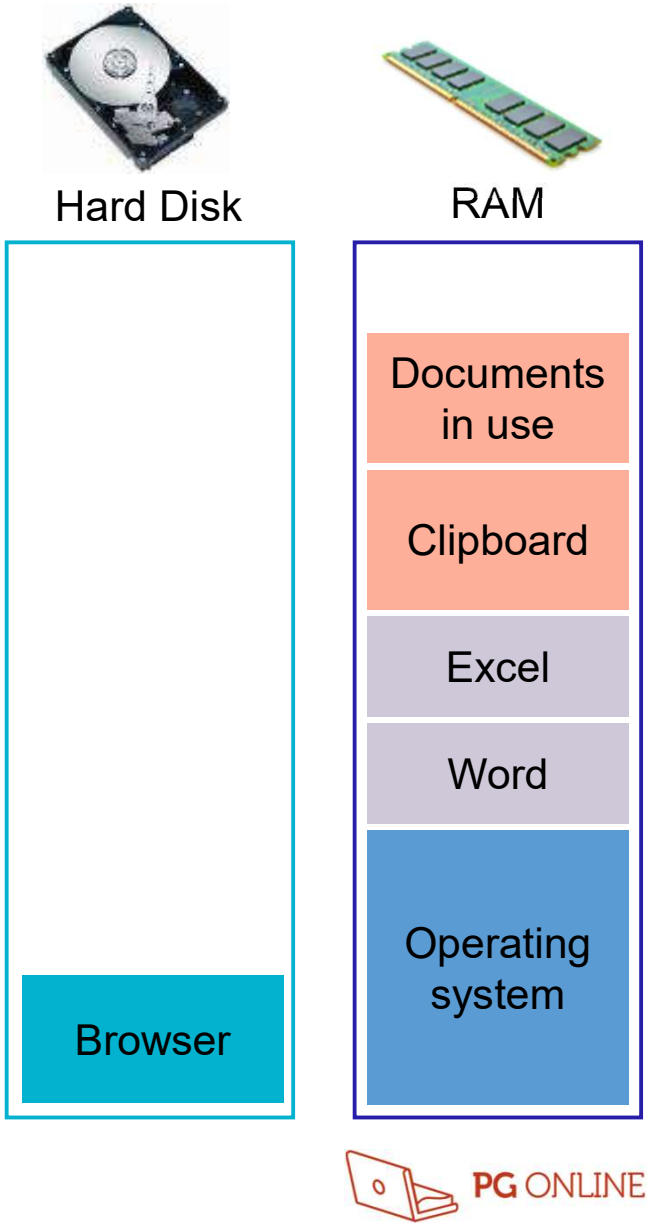
RAM

Browser



# 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?

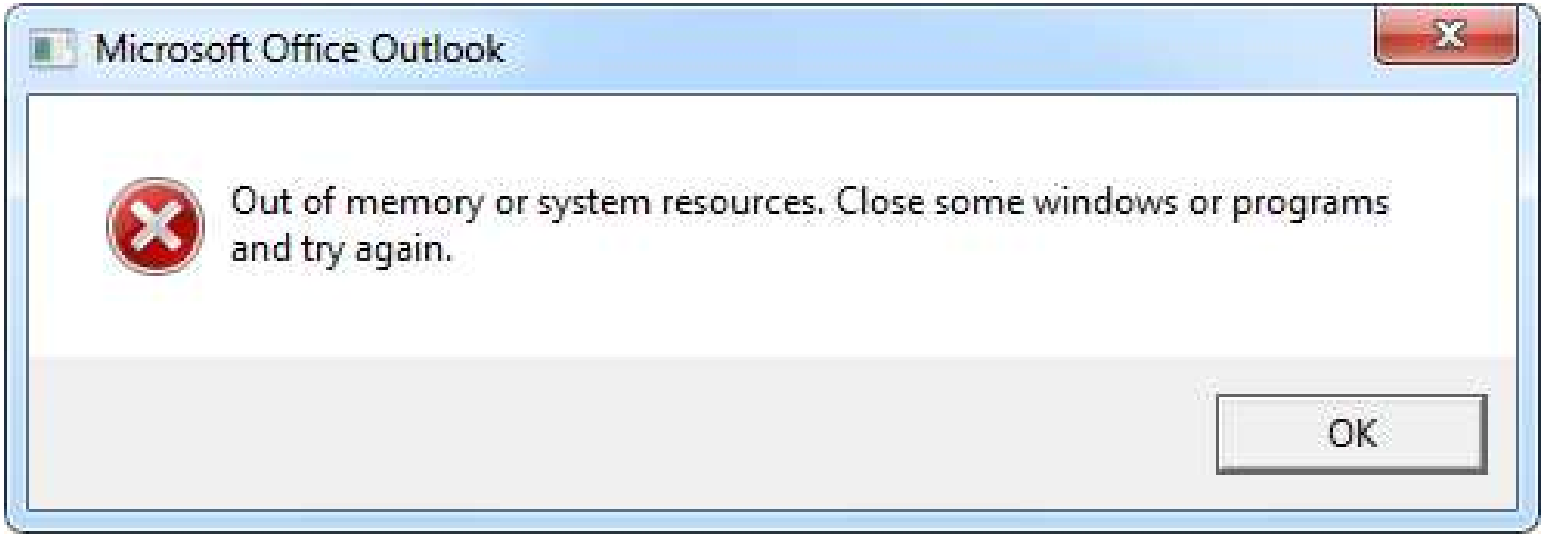


# Virtual memory

Answers

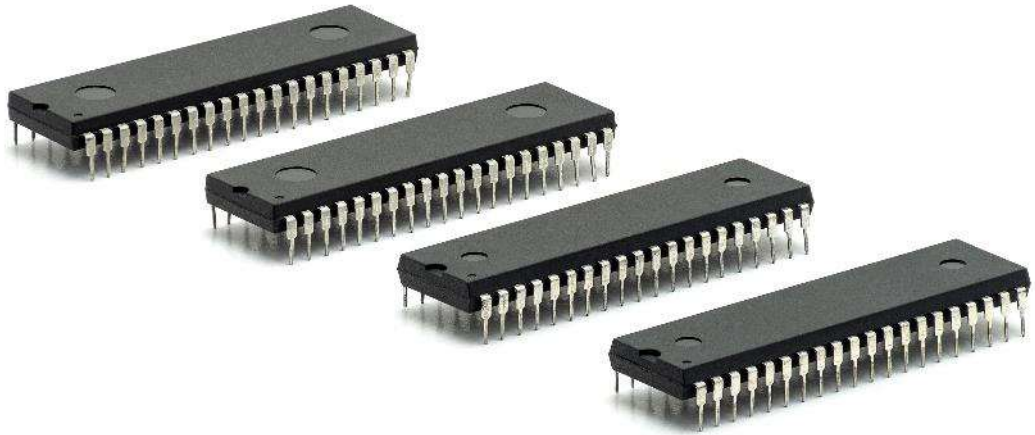
- Advantages
  - Uses cheap secondary storage on the hard drive
  - Prevents error messages saying ‘out of memory’ – the programs and files will still open
- Disadvantages
  - Accessing virtual memory is very slow
  - To access data, the existing data in RAM needs to be copied to the virtual memory,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



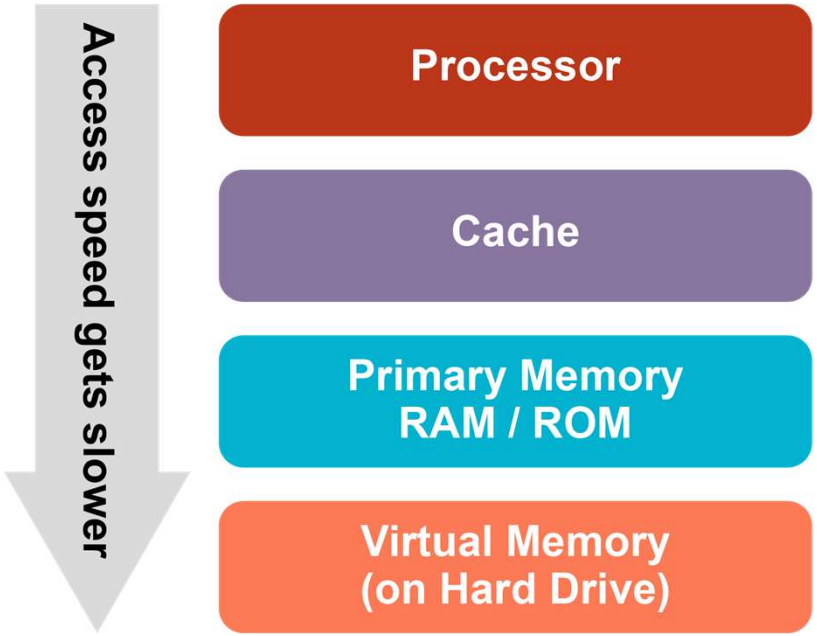
# ROM

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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