Cambridge IGCSE

Computer Science

Section 4

Software

4.1 Types of software and Interrupts

MCQ Computing

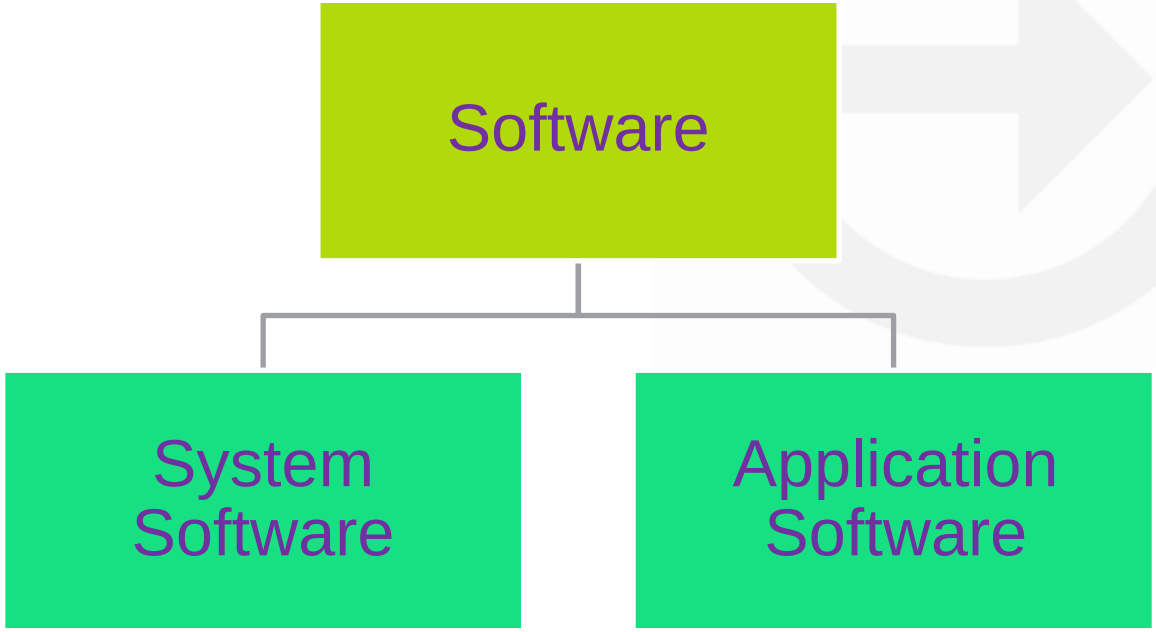
GS – 10/2022

Objectives

- Describe the difference between system software and application software and provide examples of each
- Describe the role and basic functions of an operating system
- Understand how hardware, firmware and an operating system are required to run applications software
- Describe the role and operation of interrupts

Computer systems

Categories of software



provide the services that the computer requires

Programs used to control and manage the operation of a computer

provide the services that the user requires

Programs that allow a user to do their tasks / jobs on a computer

Types of software

System software provides the services that the computer requires, includes operating system and utility software.
Programs that are needed to run the computer.

For example,
an operating system
such as Windows.

Types of software

Application software provides the services that the user requires.

Programs that are needed to perform tasks for the user.

For example, word processing software.

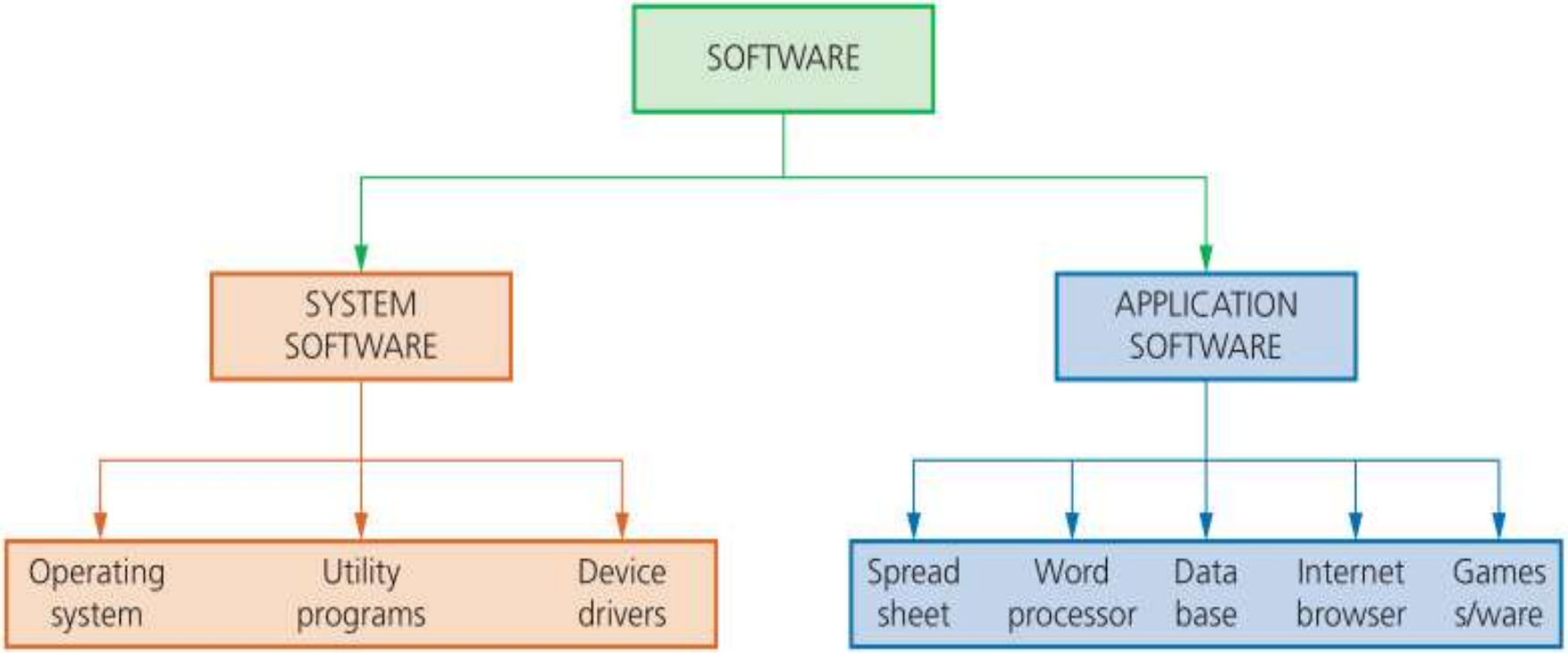
Activity

Sort the software into two groups:

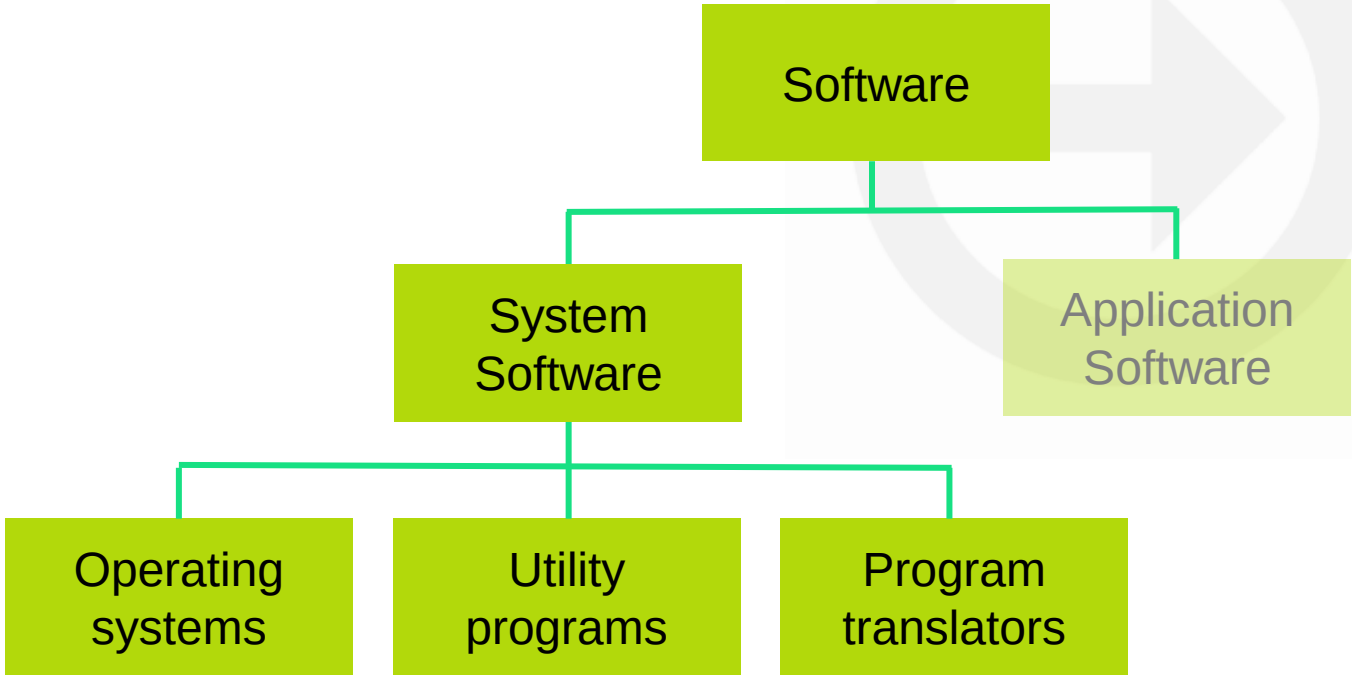
System software and **Application** software

Linux, mobile phone photo app, Outlook Express, accounting software, firewall software, Python translator, anti-virus software, mobile phone billing software, browser software, anti-virus software, spreadsheet software, till software for McDonalds, Windows 8, Fortnite game, Android mobile phone OS

Types of software

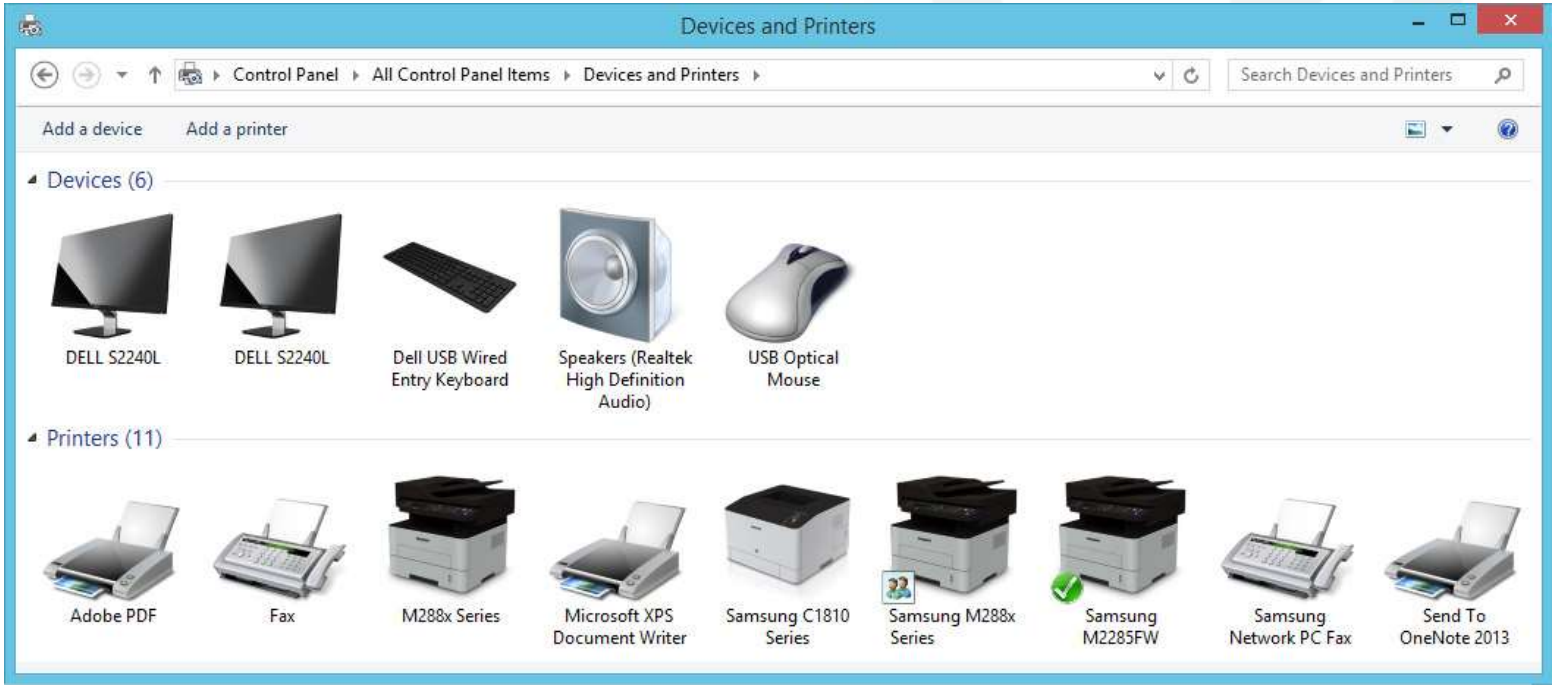


Types of system software



Operating systems

*"Systems software that ... **manages** a computer's hardware and provides a **user interface**"*



What operating systems have you heard of?

- In pairs, write down any operating systems that you've heard of

Some operating systems

- Android OS
  - Versions have nicknames such as “Nougat” and “Oreo”
- OS X (Apple MACs)
  - Versions have nicknames such as “High Sierra” and “Mojave”
- iOS (iPhone/iPad)
- MS-DOS and Windows
- Google Chrome OS (based on Linux)
- Linux

Functions of an operating system

- Provides a user interface
- Manages hardware:
  - Manages how programs use main memory
  - Allows multitasking
  - Manages peripherals (eg keyboard, mouse, printer, screen …)
  - Manages how files are stored on disks/storage devices
- Provides security - usernames, passwords and access rights

Functions of an operating system

Providing a User interface

- A user interface is required in order **to allow communication between a user and computer**

11 1101 0010 1101 0111 011

Functions of an operating system

Providing a User interface

- Without a user interface we would have to communicate in binary!
- The user interface for a device has to suit how it is used....
- How many types of interface can you name?

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Functions of an operating system

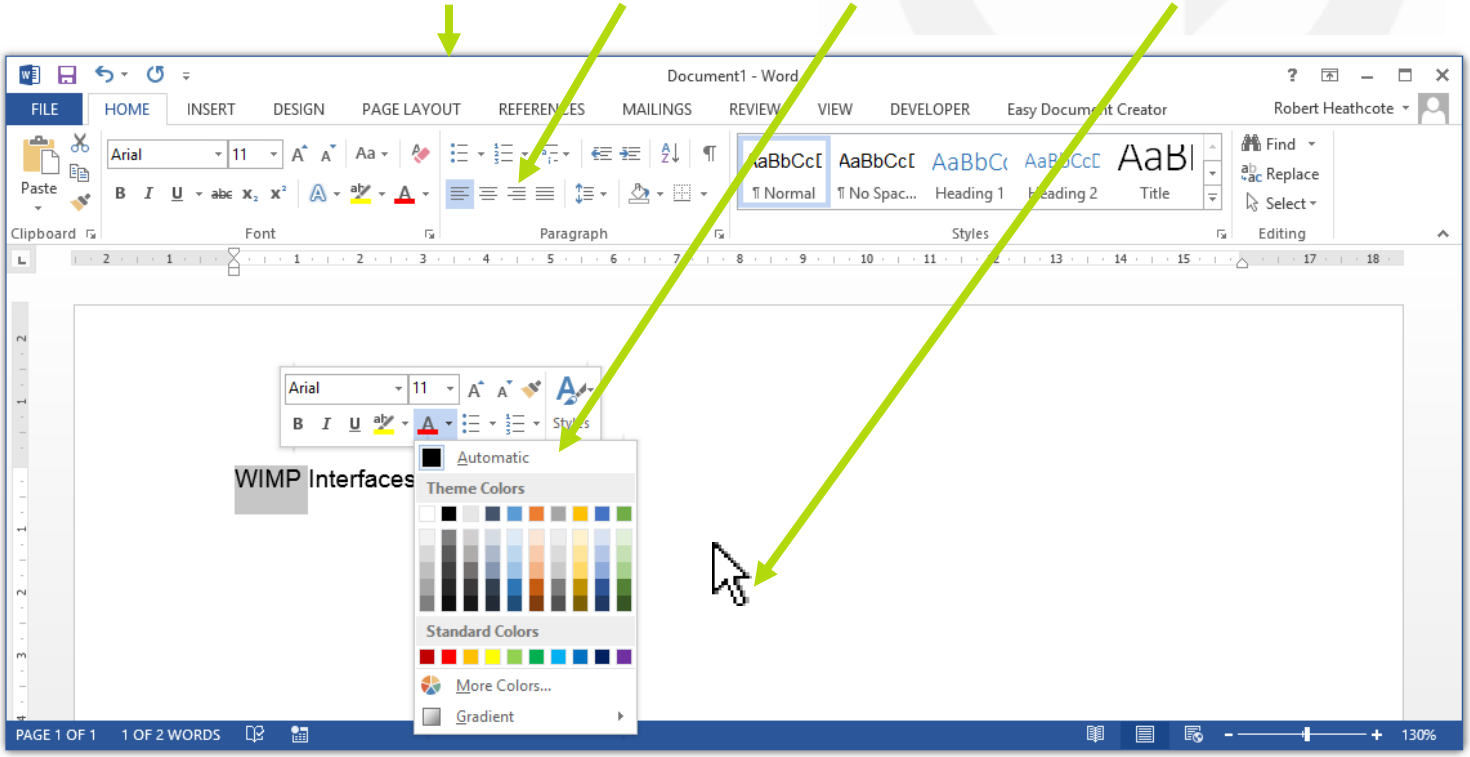
Types of User Interface

- **GUI: Graphical User Interface**
  - Example: WIMP (Windows, Icons, Menus and Pointers)
- **Menu-driven interface**
- **CLI: Command Line Interface**
  - Just text, like Windows command prompt
- Voice activated
- Real-time
  - sensors detect inputs, actuators output actions

Functions of an operating system

Types of User Interface

- Windows is a **WIMP user interface**
- Stands for: **Windows, Icons, Menus and Pointers**



Functions of an operating system

Types of User Interface

- User can click on icons using a pointer or cursor
- Icons represent main functions rather than having to type instructions
- Right-click to get context-sensitive menus
    - Different shaped pointers for different uses:

Functions of an operating system

Types of User Interface

Menu-driven interfaces

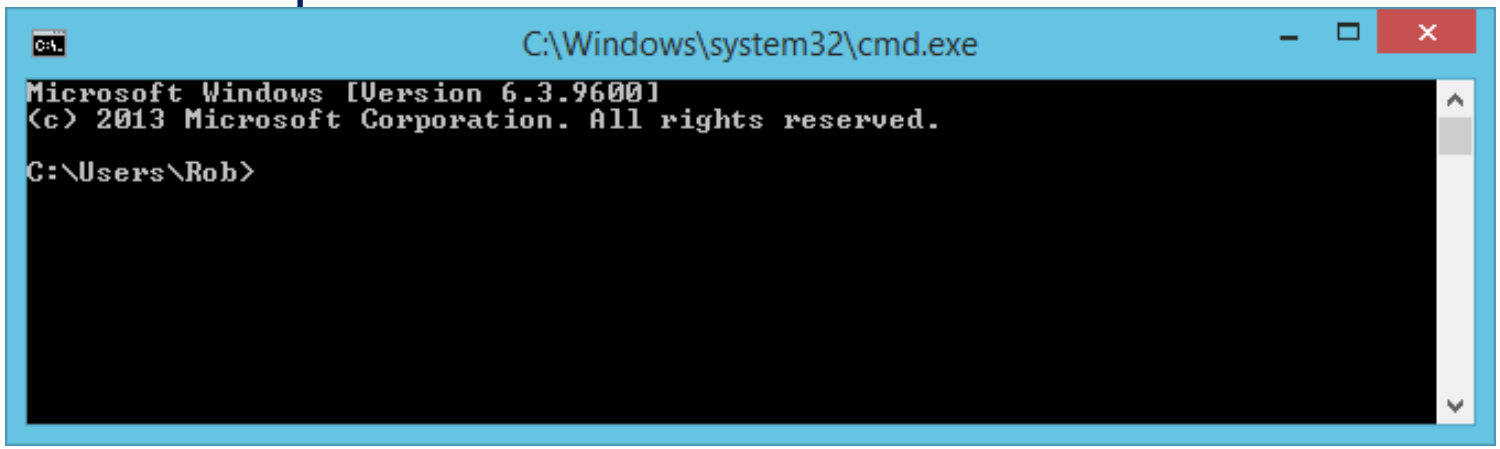
- Less commonly used but still prevalent in some areas such as music players and ATM machines

Functions of an operating system

Types of User Interface

Command line interface

- All user commands must be typed in as text
- No graphics
- Quicker for expert users who know the commands
- Takes less space on the disk and in RAM



Functions of an operating system

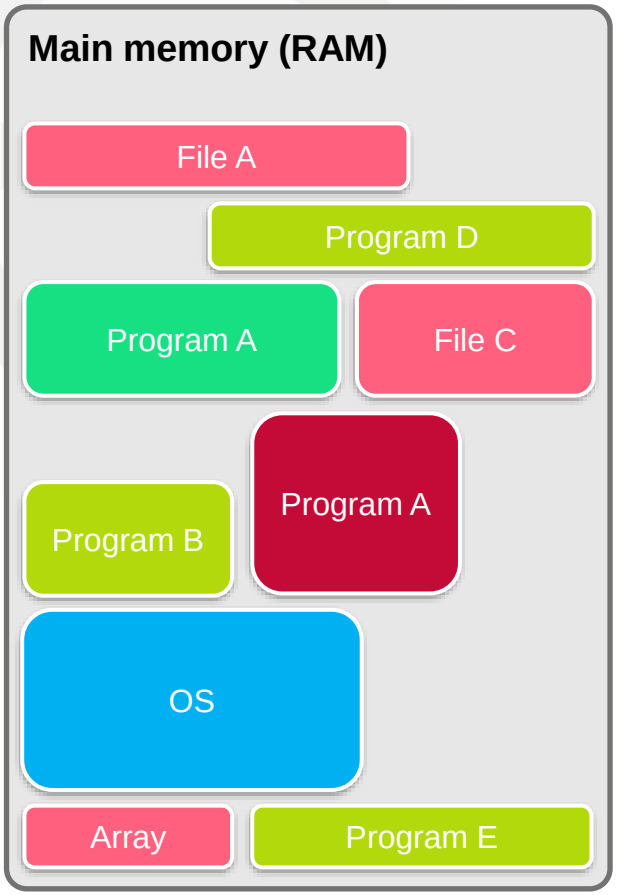
▼ **Table 4.1** Differences between GUI and CLI interfaces

Interface	Advantages	Disadvantages
command line interface (CLI)	the user is in direct communication with the computer the user is not restricted to a number of pre-determined options it is possible to alter computer configuration settings uses a small amount of computer memory	the user needs to learn a number of commands to carry out basic operations all commands need to be typed in which takes time and can be error-prone each command must be typed in using the correct format, spelling, and so on
graphical user interface (GUI)	the user doesn't need to learn any commands it is more user-friendly; icons are used to represent applications a pointing device (such as a mouse) is used to click on an icon to launch the application – this is simpler than typing in commands or a touch screen can be used where applications are chosen by simply touching the icon on the screen	this type of interface uses up considerably more computer memory than a CLI interface the user is limited to the icons provided on the screen needs an operating system, such as Windows, to operate, which uses up considerable memory

Functions of an operating system

Memory Management

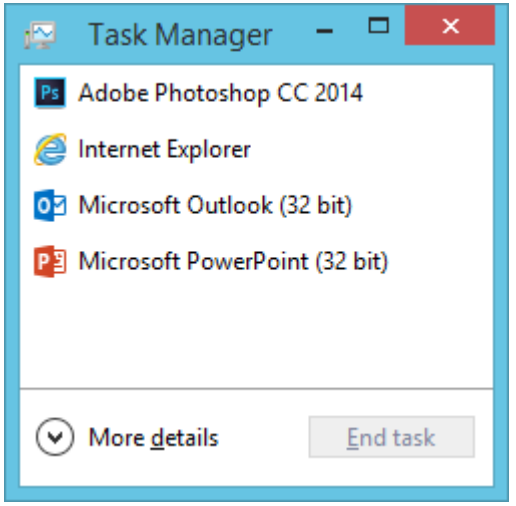
- To run a program, the computer must copy the program from storage into main memory
  - Data used by the program is copied into main memory
  - The **operating system** keeps a record of where each program and its data are located
  - It **must not overwrite** existing programs



Functions of an operating system

Managing Multi-tasking

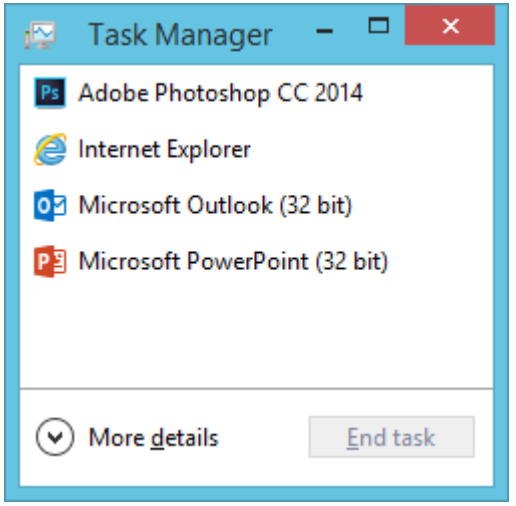
- You may use your computer to do many tasks at the same time with different software:
  homework, playing music, messaging friends...
- There are many background programs running on the computer as well
  - They are taking it in turns to get processor time to execute instructions
  - The OS must manage how the programs share the processor



Functions of an operating system

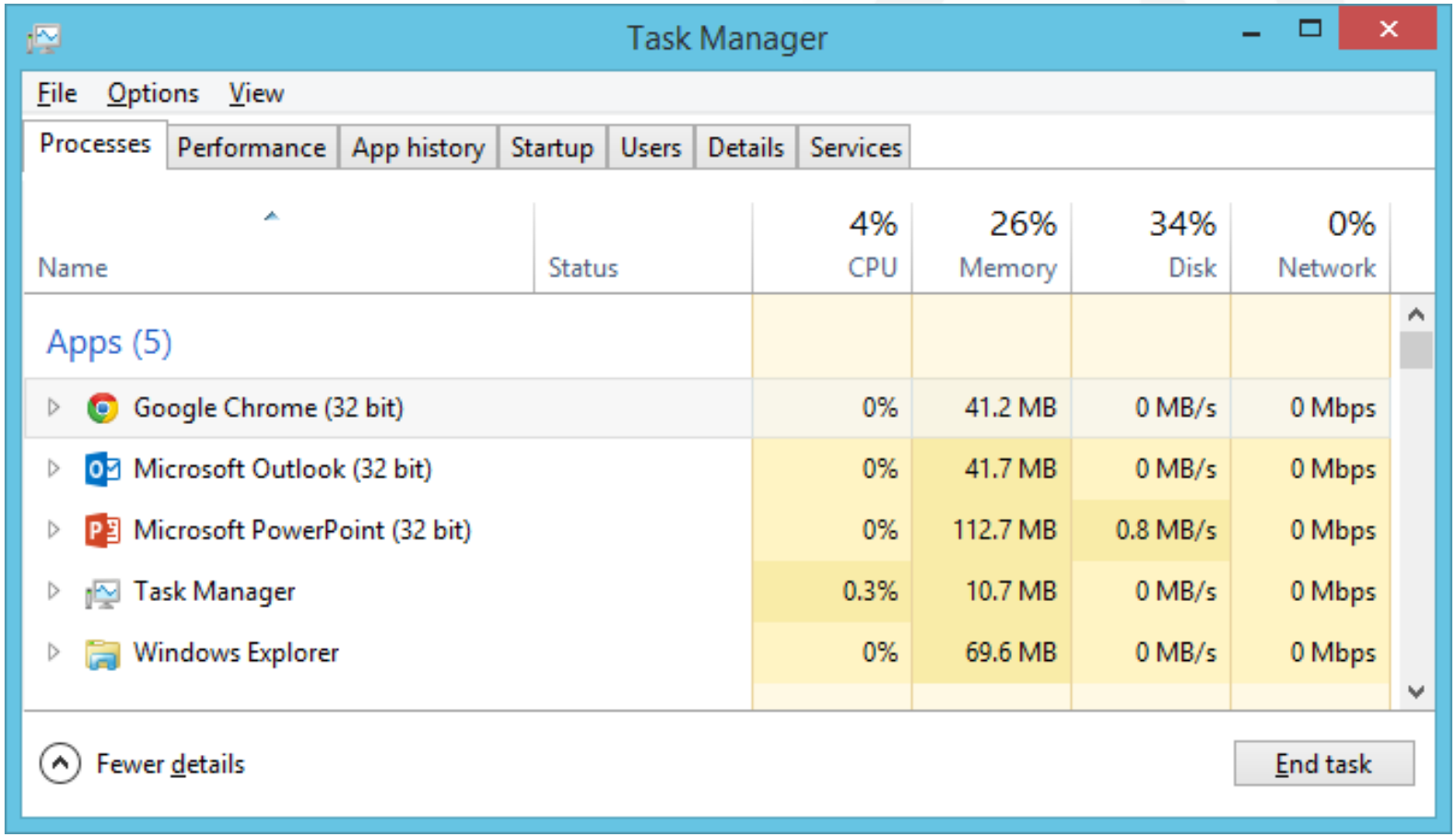
Managing Multi-tasking

- The computer may have many programs running at the same time
  - They are taking it in turns to get CPU time to execute instructions
  - The OS must manage how the programs share the processor



Functions of an operating system

Task Manager



Functions of an operating system

Manging peripherals and device drivers

- Peripherals are all the devices outside of the CPU
  - Includes input and output devices, secondary storage
- The device drivers allow communication between the computer and peripheral device.

Functions of an operating system

Sending data to a Printer

- The computer can send data thousands of times faster than the printer can print it
- The computer sends the printer output to a print buffer, a special area of memory in either the computer or the printer, at full speed
    - From here, it is transmitted it to the printer, typically a page at a time
    - The print buffer may store a number of jobs waiting to be printed

Functions of an operating system

The print buffer

- The screenshot shows a print buffer in action
  - It shows the status of each job in the buffer, and whether it is printing or waiting its turn

Functions of an operating system

File Management

- The operating system must manage:
  - Copying files from disk to main memory
  - Copying data files back to secondary storage

Functions of an operating system

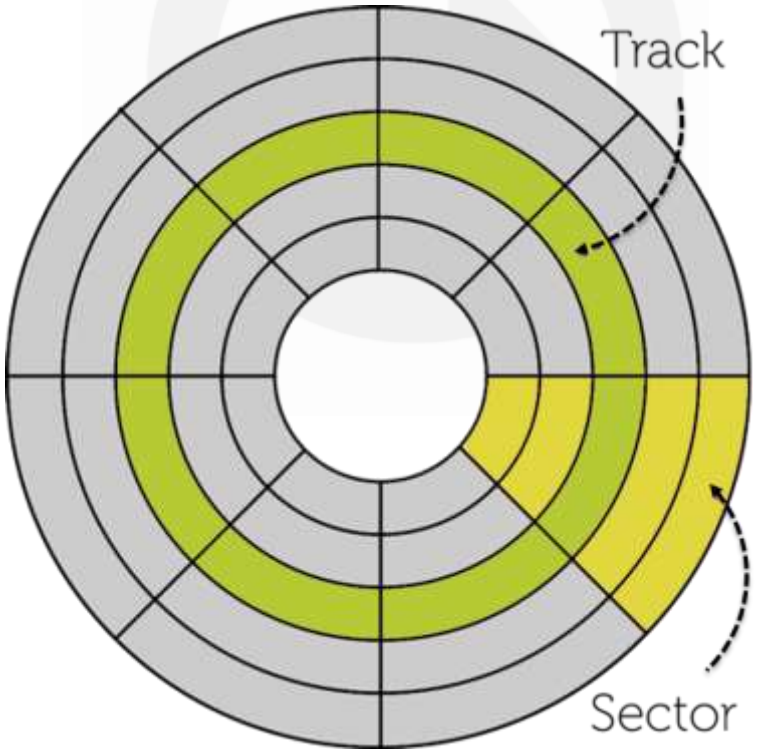
Storage Device Management

- The operating system must manage:
  - Copying files from disk to main memory
  - Copying data files back to secondary storage

Functions of an operating system

File Management

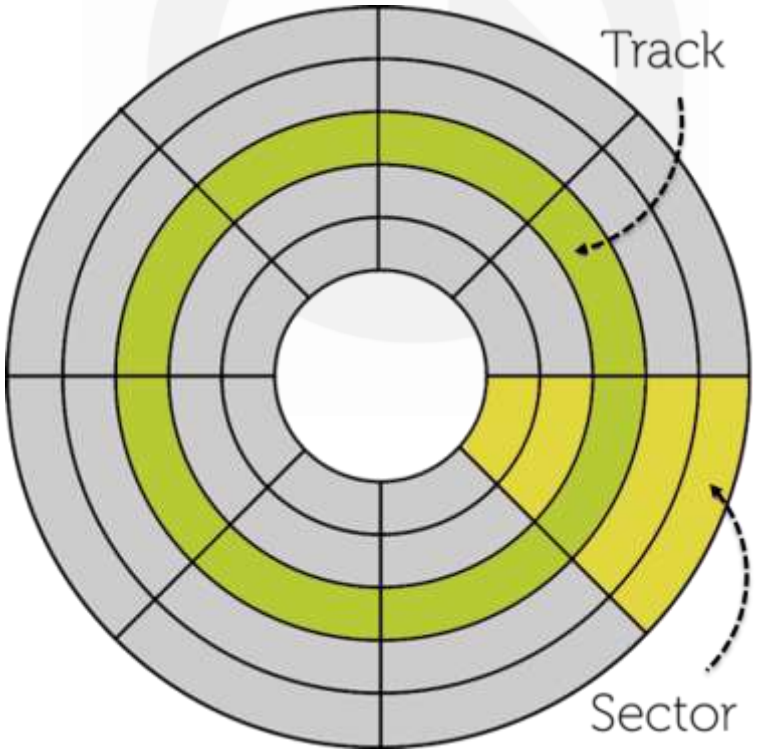
- The operating system:
  - manages where on the disk files are written
  - keeps a record of where they are so they can be retrieved
  - makes sure no file overwrites another file



Functions of an operating system

Disk and File Management

- The hard disk in a computer is a storage peripheral
- The operating system:
  - manages where on the disk files are written
  - keeps track of where they are so they can be retrieved
  - makes sure no file overwrites another file



Functions of an operating system

Managing Security

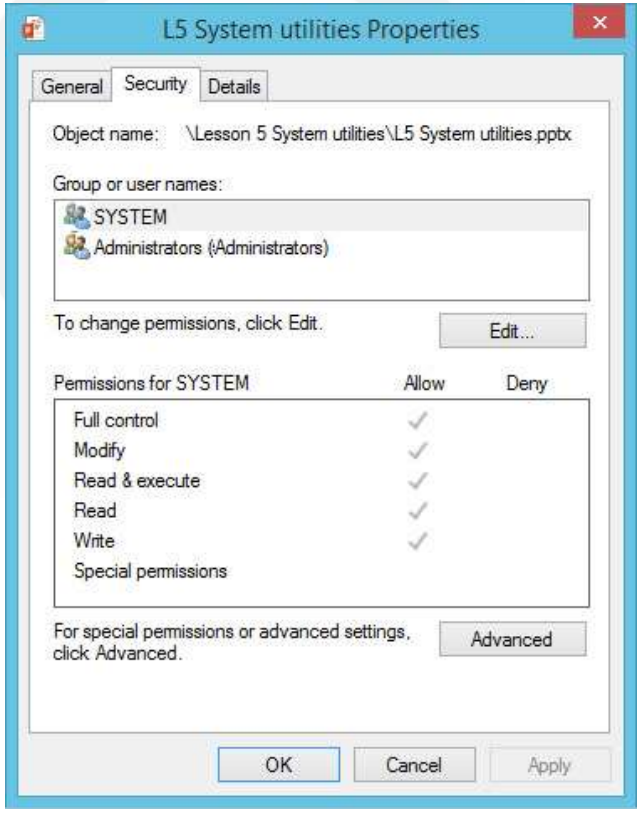
- The operating system organises user logins and passwords

  - May include password protection on individual files
  - Controls **access rights**

Functions of an operating system

Access rights

- Access rights:
  - If a computer is used by more than one person, each user should be able to see only their own files
  - Users and system administrators have different levels of access rights
  - Some users may be allowed to read files but not edit them
- May include encryption of some files



Functions of an operating system

Access Rights

- Access rights may be set on disks, folders and even individual files
- How are access rights used in school?