	Module Focus/Specific Learning Outcomes: make sure that you write the key unit objectives to be acquired at the end of the unit.
	Learning Activity: Complete a learning activity. This will help you to review or practise what you have learned and to prepare you for an assignment or an examination. You will not submit learning activities to your tutor/marker. Instead, you will compare your responses to those provided in the Learning Activity Answer Key found at the end of the applicable module.
	Video/Flashcard app: View a video.
	Stop/Caution: Use caution when conducting this learning activity or experiment.
	Assignment: Complete an assignment. You will submit your completed assignments to your tutor/marker for assessment in accordance with the chart found in the course Introduction.
	Learning Partner: Ask your learning partner to help you with this task.
	Note: Take note of and remember this important information or reminder.
	Examination: Write your final examination at this time.

UNIT 5	VOCABULARY	SKILLS WORK	FUNCTIONS	QUIZ
5.1 **Storage devices**	**Lead-in activity** Read the text about different storage devices	**Reading** Storage Devices, RAID Types of Drive Interfaces **Listening** Watch a video about different storage devices Watch a video about different device connectors	To understand the main functions of the Storage Devices and the Types of Drive Interfaces To identify types of storage devices To broaden vocabulary connected to the topic To enhance reading comprehension To develop critical thinking through supporting own suggestions	
5.2 **Internal cables**	**Lead-in activity** Answering the questions – describing Internal cables	**Reading** Internal Cables	To understand the main purpose of Internal Cables To broaden vocabulary connected to the topic To enhance reading comprehension	10-question test to understand better the subject

In this unit, you will learn;

- To identify types of storage devices and understand their use
- To understand the main purpose of internal cables
- To broaden vocabulary related to the topic

1 **Lead-in Activity:**

Read the text below and match the pictures 1-5 with types of storage devices a) - e)

1

2

3

4

5

a) Flash drive	b) Floppy drive	c) Optical drive	d) Hard drive	e) Tape drive

STORAGE DEVICES, RAID

Storage drives read information from or write information to magnetic, optical, or semiconductor storage media. The drive can be used to store data permanently or to retrieve information from a media disk. Storage drives can be installed inside the computer case, such as a hard drive. For portability, some storage drives can connect to the computer using a USB port, a FireWire port, eSATA, or a SCSI port. These portable storage drives are sometimes referred to as removable drives and can be used on multiple computers. Here are some common types of storage drives:

Floppy Drive

A floppy drive, or floppy disk drive, is a storage device that uses removable 3.5-inch floppy disks. These magnetic floppy disks can store 720 KB or 1.44 MB of data. In a computer, the floppy drive is usually configured as the A: drive. The floppy drive can be used to boot the computer if it contains a bootable floppy disk. A 5.25-inch floppy drive is older technology and is seldom used.

Hard Drive

A hard drive, or hard disk drive, is a magnetic device used to store data. In a Windows computer, the hard drive is usually configured as the C: drive and contains the operating system and applications. The storage capacity of a hard drive ranges from gigabytes (GB) to terabytes (TB). The speed of a hard drive is measured in revolutions per minute (RPM). This is how fast the spindle turns the platters that hold data. The faster the spindle speed, the faster a hard drive can retrieve data from the platters. Common hard drive spindle speeds include 5400, 7200, 10,000, and up to 15,000 RPM in high-end server hard drives. Multiple hard drives can be added to increase storage capacity.

Traditional hard drives use magnetic-based storage. Magnetic hard drives have drive motors that are designed to spin the magnetic platters and move the drive heads. In contrast, the newer solid state drives (SSDs) do not have moving parts and use semiconductors to store data. Because an SSD has no drive motors and moving parts, it uses much less energy than a magnetic hard drive. Non-volatile flash memory chips manage all storage on an SSD, which results in faster access to data, higher reliability, and reduced power usage. SSDs have the same form factor as magnetic hard drives and use ATA or SATA interfaces. You can replace a magnetic drive with an SSD.

Tape Drive

Magnetic tapes are most often used for backups or archiving data. The tape uses a magnetic read/write head. Although data retrieval using a tape drive can be fast, locating specific data is slow because the tape must be wound on a reel until the data is found. Common tape capacities vary between a few gigabytes to many terabytes.

Optical Drive

An optical drive uses lasers to read data on the optical media. There are three types of optical drives:
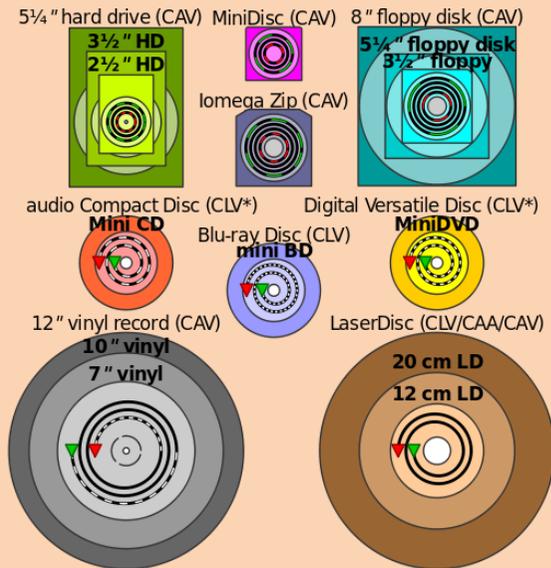
- Compact disc (CD)

- Digital versatile disc (DVD)

- Blu-ray disc (BD)

CD, DVD, and BD media can be pre-recorded (read only), recordable (write once), or re-recordable (read and write multiple times). CDs have a data storage capacity of approximately 700 MB. DVDs have a data storage capacity of approximately 4.7 GB on a single-layer disc, and approximately 8.5 GB on a dual-layer disc. BDs have a storage capacity of 25 GB on a single-layer disc, and 50 GB on a dual-layer disc.

There are several types of optical media:

- **CD-ROM** - CD read-only memory media that is pre-recorded

- **CD-R** - CD recordable media that can be recorded one time

- **CD-RW** - CD rewritable media that can be recorded, erased, and re-recorded

- **DVD-ROM** - DVD read-only memory media that is pre-recorded

- **DVD-RAM** - DVD RAM media that can be recorded, erased, and re-recorded

- **DVD+/-R** - DVD recordable media that can be recorded one time

- **DVD+/-RW** - DVD rewritable media that can be recorded, erased, and re-recorded

- **BD-ROM** - Blu-ray read-only media that is pre-recorded with movies, games, or software

- **BD-R** - Blu-ray recordable media that can record high-definition (HD) video and PC data storage one time

- **BD-RE** - Blu-ray rewritable format for HD video recording and PC data storage

5¼″ hard drive (CAV) MiniDisc (CAV) 8″ floppy disk (CAV)
3½″ HD
2½″ HD
5¼″ floppy disk
3½″ floppy
Iomega Zip (CAV)
audio Compact Disc (CLV*) Digital Versatile Disc (CLV*)
Mini CD
MiniDVD
Blu-ray Disc (CLV)
mini BD
12″ vinyl record (CAV) LaserDisc (CLV/CAA/CAV)
10″ vinyl
7″ vinyl
20 cm LD
12 cm LD

Comparison of several forms of disk storage showing tracks (not to scale); green denotes start and red denotes end. Direction of spirals are as viewed from the top (normally label side). * Some CD-R(W) and DVD-R(W)/DVD+R(W) recorders operate in ZCLV, CAA or CAV modes.
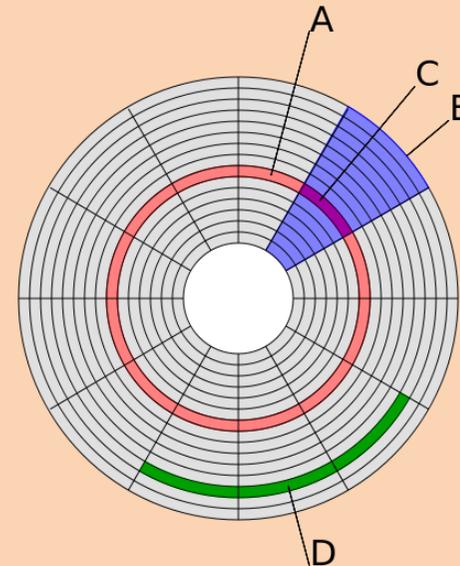
Disk structure showing a track (A), a sector (B) and a sector of track (C) and a cluster of sectors(D).

External Flash Drive

An external flash drive, also known as a thumb drive, is a removable storage device that connects to a USB port. An external flash drive uses the same type of non-volatile memory chips as SSDs and does not require power to maintain the data. These drives can be accessed by the operating system in the same way that other types of drives are accessed.

2 📹 **Watch a video about different storage devices and answer the questions below.**

1. What are the main parts of a hard disc drive?
2. How are called series of rings on a platter?
3. How are tracks divided?
4. What does the abbreviation SSD stand for?
5. What does MBR (master boot record) contain?
6. What's the capacity of a dual layer Blu-ray disc?
7. What are tape drives mostly used for?

3 **Data can be accessed either sequentially or directly on some devices. Other devices allow only sequential access. Write down what type of access is possible for each of the storage devices:**

DEVICE	SEQUENTIAL	DIRECT
Floppy Disc drive		
Hard disc drive		
Tape drive		
CD-ROM drive		

4 **Read the text below and watch a video about different device connectors and cables.**

Types of Drive Interfaces

Hard drives and optical drives are manufactured with different interfaces that are used to connect the drive to the computer. To install a storage drive in a computer, the connection interface on the drive must be the same as the controller on the motherboard. Here are some common drive interfaces:

- **IDE** - Integrated Drive Electronics, also called Advanced Technology Attachment (ATA), is an early drive controller interface that connects computers and hard disk drives. An IDE interface uses a 40-pin connector.

- **EIDE** - Enhanced Integrated Drive Electronics, also called ATA-2, is an updated version of the IDE drive controller interface. EIDE supports hard drives larger than 512 MB, enables Direct Memory Access (DMA) for speed, and uses the AT Attachment Packet Interface (ATAPI) to accommodate optical drives and tape drives on the EIDE bus. An EIDE interface uses a 40-pin connector.

- **PATA** - Parallel ATA refers to the parallel version of the ATA drive controller interface.

- **SATA** - Serial ATA refers to the serial version of the ATA drive controller interface. A SATA interface uses a 7-pin data connector.

- **eSATA** - External Serial ATA provides a hot-swappable, external interface for SATA drives. Hot-swapping is the ability to connect and disconnect a device while a computer is powered on. The eSATA interface connects an external SATA drive using a 7-pin connector. The cable can be up to 6.56 ft. (2 m) in length.

- **SCSI** - Small Computer System Interface is a drive controller interface that can connect up to 15 drives. SCSI can connect both internal and external drives. An SCSI interface uses a 25-pin, 50-pin, or 68-pin connector.

RAID provides a way to store data across multiple hard disks for redundancy. To the operating system, RAID appears as one logical disk. The following terms describe how RAID stores data on the various disks:

- **Parity** - Detects data errors.

- **Striping** - Writes data across multiple drives.

- **Mirroring** - Stores duplicate data on a second drive.

Unit 5.2

Internal cables

➢ *Types of internal cables*

1 Lead-in Activity:

Read the text and find the following:

1. How many pins are there at PATA and SATA connector?
2. How many pins can you find at a floppy drive cable?
3. Before USB connectors, which connector was used for connecting a mouse or a keyboard to a computer?
4. Which connectors are usually used for Ethernet connection?
5. In TRS plugs, what do the letters TRS stand for?

INTERNAL CABLES

Drives require both a power cable and a data cable. A power supply might have SATA power connectors for SATA drives, Molex power connectors for PATA drives, and Berg connectors for floppy drives. The buttons and the LED lights on the front of the case connect to the motherboard with the front panel cables.

Data cables connect drives to the drive controller, which is located on an adapter card or on the motherboard. Here are some common types of data cables:

- **Floppy disk drive (FDD) data cable** - Has up to two 34-pin drive connectors and one 34-pin connector for the drive controller.

- **PATA (IDE/EIDE) 40-conductor data cable** - Originally, the IDE interface supported two devices on a single controller. With the introduction of Extended IDE, two controllers capable of supporting two devices each were introduced. The 40-conductor ribbon cable uses 40-pin connectors. The cable has two connectors for the drives and one connector for the controller.

- **PATA (EIDE) 80-conductor data cable** - As the data rates available over the EIDE interface increased, the chance of data corruption during transmission increased. An 80-conductor cable was introduced for devices transmitting at 33.3 MB/s and over, allowing for a more reliable balanced data transmission. The 80-conductor cable uses 40-pin connectors.

- **SATA data cable** - This cable has seven conductors, one keyed connector for the drive, and one keyed connector for the drive controller.

- **SCSI data cable** - There are three types of SCSI data cables. A narrow SCSI data cable has 50 conductors, up to seven 50-pin connectors for drives, and one 50-pin connector for the drive controller, also called the host adapter. A wide SCSI data

cable has 68 conductors, up to 15 68-pin connectors for drives, and one 68-pin connector for the host adapter. An Alt-4 SCSI data cable has 80 conductors, up to 15 80-pin connectors for drives, and one 80-pin connector for the host adapter.

A coloured stripe on a floppy or PATA cable identifies Pin 1 on the cable. When installing a data cable, always ensure that Pin 1 on the cable aligns with Pin 1 on the drive or drive controller. Keyed cables can be connected only one way to the drive and drive controller.

2 **In pairs think of safety guidelines that computer technicians need to know before they do any work on operating computers. Discuss those guidelines with your partners.**

3 **Look at the safety guidelines in the table below and put these guidelines into two groups: one group for the guidelines for working inside a computer, and one group for working on computer configurations. Which guidelines will be for you the most difficult and the easiest to follow? Use an extra sheet.**

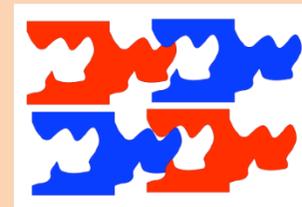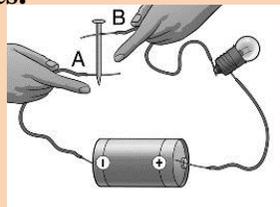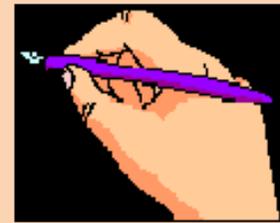|	
Disconnect the computer before you work on it.	**Keep organized and put tiny parts in a container.**
Ground yourself when working inside a computer.	**Make sure you don't force connections – things should fit together easily.**
Always use insulated tools to prevent yourself from getting shocked.	**Be able to go back to the original settings of the computer.**
Be careful working with delicate circuitry & avoid contact with metal wires.	**Write down any changes you made and how you made them.**

Always keep your workspace clean.	Protect files.
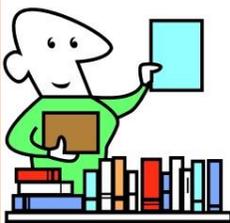
Now divide guidelines for working inside a computer into two categories: those guidelines for protecting the computer and those guidelines for protecting yourself.

PERSONAL PROTECTION	COMPUTER PROTECTION

In pairs, discuss what you should or shouldn't do to protect your data. Use the suggestions below.

Example: discuss on top of each other (stack)

You shouldn't stack discs on top of each other. / Don't stack discs on top of each other.

1. Your anti-virus program regularly, since new viruses are created everyday (update)
2. Discs in a protective case (store)
3. Passwords and security devices to protect confidential information (use)
4. On discs with permanent marker pens (write)
5. The disc into the disc drive carefully (insert)
6. Floppies or hard drives near magnets; they can damage the data stored on them (leave)

6 ~~Look into the table below at a list of reasons why we follow the guidelines~~ and write the guideline that goes with each reason.

REASON	GUIDELINE
It's important to protect the computer from being damaged by your body's static electric charges. It also prevents you from shock.	
Even when a computer power supply and monitor are off, they can hold an electrical charge.	
Some PCs run a small current through the motherboard even when the PC is off. If a circuit in the computer is live, just one drop of liquid can destroy sensitive electronics.	
You need to be sure that you can put the computer back together.	
Liquids or crumbs can damage computer components, and mess can make you less careful with computer parts.	
If you start fixing a problem but you run into trouble, you have to go back to the original settings.	

Too much force could damage the motherboard, which could ruin the computer. Also, you might be putting something in the wrong place!	
Often, you can't get a file back that you erased.	
You want to be able to record the way you fixed the problem (maybe you will fix a similar problem in the future) and you don't want to repeat steps.	
You could loosen or damage connections.	

7 Think of both a computer and a person as information-processing machines. Identify the four components of an information-processing device for both and complete the following table:

	COMPUTER	HUMAN
INPUT IS DONE WITH…		
STORAGE IS DONE WITH…		

INFORMATION PROCESSING IS DONE BY…		
OUTPUT IS DONE WITH…		

8

QUIZ - please click on the icon.

Sources:

Resources available under creative commons licence [2015-12-12]

https://upload.wikimedia.org/wikipedia/commons/thumb/0/0a/PC-Internal-Floppy-Drive.jpg/751px-PC-Internal-Floppy-Drive.jpg

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https://upload.wikimedia.org/wikipedia/commons/thumb/d/d7/Disk-structure.svg/600px-Disk-structure.svg.png

https://upload.wikimedia.org/wikipedia/commons/thumb/d/d8/IBM_2401_tape_drives_at_the_Computer_History_Museum.jpg/800px-IBM_2401_tape_drives_at_the_Computer_History_Museum.jpg

https://youtu.be/FcAjsCIhCOg

https://youtu.be/UXZSsmghl1M

GLAFKA's sources:

Quiz: http://glafka.cz/evet/unit5/quiz_u5/Storagedevices_unit5.htm