Blocks, Partitions, partition tables, filesystems, volumes and mounting filesystems

a) Block:
A physical area on your storage device (hard drive, usb drive or SD card) where data can be stored. Storage devices are divided in millions of blocks. Each block owns a number that identifies a block called LBA. Typical sizes of a block can be: 512 bytes, 1KiB (1024 bytes), 2KiB (2048 bytes) or 4KiB (4096 bytes).

b) Partition:
- A partition is a division on a storage device that is treated as a separate unit by operating systems. Each partition can be utilized independently without affecting one another.
- In order to store data (files and directories) or install an operating system on your hard drive, usb drive or SD card, one or more partitions must be created.
- For each partition, the following information must be stored on the drive:
  - Starting LBA block
  - Ending LBA block
  - Size (MiB, GiB or TiB)
  - Partition type (identifier of the installed filesystem)
  - Flags

c) Partition table:
- The disk stores the information about the partitions in an area known as the partition table that the operating system reads before any other part of the disk.
- Before creating any partition, a partition table must be created on the disk.
- There are two type of partition tables:
  - The old traditional **MBR** partition tables.
  - The new and modern **GPT** partition tables.

d) Filesystem:
- Before storing data or installing an operating on a partition, you have to install a filesystem on that partition. No data can be stored in a partition with no filesystem.
- Different operating systems work with different filesystems:
  - Typical filesystems for Linux: ext4, ext3, ext2, swap, reiser4, reiserfs
  - Typical filesystems for Windows: NTFS, ReFS, FAT32, exFAT, FAt16

e) Mounting filesystems:
- It is a process by which the operating systems makes data (files and directories) on a partition of a storage device (hard drive, usb drive, SD card, DVD or network shared folder) available for users.
- Only partitions with a filesystem installed can be mounted.
- Mounting a filesystem inside a partition attaches that filesystem to a directory (**mount point**) and makes it available to the system and the users.
- When you access to the mount point (in other words, change to the directory with command cd) you can create, read, update or delete data on the partition.

f) A Volume can be a:
- a single partition of a hard drive
- A combination of some partitions in a hard drive
- A combination of all partitions in a hard drive
- A combination of partitions in multiple hard drives
- A combinations of all partitions in multiple hard drives

that the operating system shows to the user as a single device with a single filesystem installed. Users believe that they work with a single device when in fact they are working with a combination (or only a part) of a physical device.

g) How to manage partitions on Linux:
- **gdisk** and **fdisk** are command-line tools to create, read, update or delete partition tables.
- **gdisk** and **fdisk** are command-line tools to create, read, update or delete partitions.
- **mkfs** is a command-line tools to install, change or remove a filesystem on a partition
- **mount** is a command-line tools to mount or unmount a filesystem inside a partition.
- **GParted** is a GUI partition manager to:
  - create, read, update or delete partition tables.
  - create, read, update or delete partitions.
  - install, change or remove a filesystem on a partition

g) Working with partitions:
1. Create a partition tables
2. Create one or more partitions
3. Install a filesystem on each partition
4. Mount each partition

h) Advantages of partitions:
- A single hard drive can contain multiple multiple operating systems.
- Data encapsulation data. A corrupted partition does not affect the others.
- Prevent programs or users for consuming all the space
- Increase disk space efficiency inside the partition (ratio space usable vs total space).