What is RAID.

- Stands for Redundant Array of Independent disks.
- Means of storing same data in different location on multiple HDD/SSD to secure data in event of disk failure.
- gives you high transfer rate.

How does this stuff give you high transfer rate

→ By means of stripping.

stripping Here means, when an individual file is split & written to more than one disk. This is the way by which RAID gets around the performance limitation of Mechanical storage.

In case of 4 disk array each disk will have ¼ of file. So the file can be written quickly as well as read very fast as compared to single disk.

- we have 2 types of stripping

1) Bit level stripping : splits ~~each~~ bit of each byte across multiple disk.

- So read time is quicker however seek time sucks. ~~How~~ Improves transfer rate.

2) Block level : Blocks of files (usually 512 B) are stored across multiple disk.

Levels in RAID:

1] **Level 0 (striping):-** In this data is split into blocks & stored into multiple disk (atleast 2). This offers far superior I/O performance in read/write. However this stuff is not fault tolerance. i.e if one disk fails then all the data in that disk gets lost.

2] **Level 1 (mirroring):-** It is the simplest way to give redundant storage. Here data is written to identically to multiple disk (Atleast 2 disk). even if one disk fails, the data is not lost as it is stored in other disks too. performance & storage will be 50% as we are duplicating the work.

3] **Level 2 (parity):-** Here parity can be used along with striping to offer the redundancy without losing the storage space to duplicate data. As using parity we can detect data errors as well as correct it. However calculating parity bits is computationally expensive. It is bit level stripping.

4] **Level 3 (bit interleaved parity):-** It utilizes bit-level stripping & a dedicated parity disk. This dedicated parity disk stores the parity info of all the disk. So data can be accessed parallely from multiple disk.

5] **Level 4 (Block level striping with dedicated parity):-** It consist of block level data striping across 2 or more idependent disk & dedicated parity disk. Even if one disk fails, using parity & other disk data can be recovered.

However the transfer rate is slower. But read operations are faster.

5) Level 5 (striping with parity): Here it combining both parity & ~~block level~~ stripping. The data is distributed across multiple disk & the parity bits are stored evenly on all disk after each sequence of data is stored. So it provides high speed & reliability & fault tolerance. It is complex to implement. If more than one disk fails data is lost. write speed is also slow.

6) Level 6 (stripping with double parity): Its implementation is similar to RAID 5 but it stores extra redundant info to guard against multiple disk failure. It stores two parity block for each data block. It gives high fault tolerance & fast read operations. But it is complex & expensive.

Level 5 & Level 2 looks similar however there is a difference. Level 2 uses bit stripping while Level 5 uses block striping. ~~so due~~ to This means parity is counted on every bit instead of block therefore making level 2 expensive & ~~its~~ inpractical in most real world cases.