SINGAPORE POLYTECHNIC
SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING
ET0023 OPERATING SYSTEMS

TUTORIAL 9 – Disk Storage (Suggested Solutions)

1.

Term	Explanation
Track	A **disk drive track** is a circular path on the surface of a disk or diskette on which information is magnetically recorded and from which recorded information is read.
Sector	A **sector** is a subdivision of a track on a magnetic. Each sector stores a fixed amount of user data
Cylinder	Cylinders are vertically formed by tracks. In other words, track 12 on platter 0 plus track 12 on platter 1 etc. is cylinder 12. The number of cylinders of a disk drive exactly equals the number of tracks on a single surface in the drive
MBR	A **master boot record** (**MBR**) is a type of boot sector for the IBM Personal Computer. It consists of a sequence of 512 bytes located at the first sector of a data storage device such as a hard disk. MBRs are usually placed on storage devices intended for use with IBM PC-compatible systems
Latency	(Rotational) latency is the delay waiting for the rotation of the disk to bring the required disk sector under the read-write head.
Average Seek Time	The **seek time** measures the time it takes the head assembly on the actuator arm to travel to the track of the disk where the data will be read or written.

WD Caviar Green, 3.5" 1TB SATA 3Gb/s:
http://www.wdc.com/wdproducts/library/SpecSheet/ENG/2879-701229.pdf

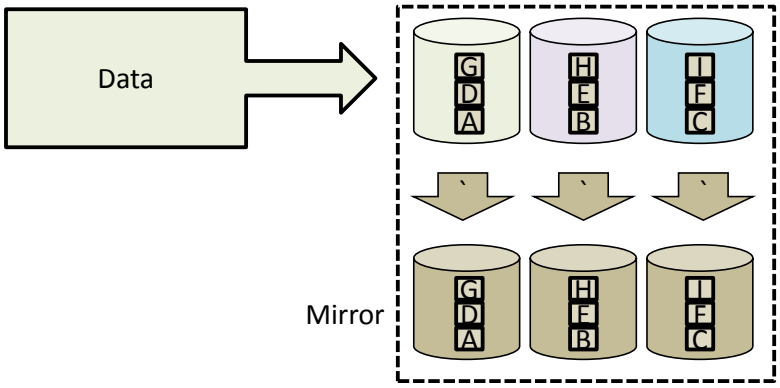
Other important parameters:
Rotational speed, Cache Size, Data transfer rate, Power consumption, Operating temperature.

2. Mathematical calculation: 80GB = 80,000,000,000 / 2^30 = 74.5 GB
The disk drive industry uses 1 M as 1,000,000 and 1G as 1,000,000,000

A sector is the smallest unit (block) which is written to the disk. In order to differentiate each sector from another, there is a preamble before the data and an ECC for error corrections and checking.

Error Correction Code

3. RAID = Redundant Array of Independent Hard Disks



The RAID system consists of 2 arrays of identical drives. The first array is configured in a RAID 0 configuration using striping. Data is striped across the first array achieving high performance in reading/writing.
Each drive in the 1st array is mirrored on the second array. Should one of the drives from the original array fail, the drive from the 2nd array can be automatically put into play without loss of information.

	RAID 1+0	**RAID 5**
Read Performance	Good (Striped)	Good (Striped)
Write Performance	Good (Striped)	Poor (Parity checked)
Redundancy	Full mirror	One drive failure only
Efficiency	50% (5TB data – 5TB mirror)	90% (9TB data + 1 TB parity)

4.

Task	**Linux command(s)**	**Comment**
Partition the hard disk	gparted	Create single large partition, assuming this is the second hard disk then will be called /dev/sdb
Format with default File System (either ext2, ext3, or ext4)	gparted or mkfs.ext2 /dev/sdb1	Format partition, as there is only 1 partition, sdb1
Mount the drive to directory /srv	mount /dev/sdb1 /srv	Can be hard coded into /etc/fstab so that available on boot
Create directories on /srv Give user1 the necessary rights using chmod/chown	mkdir /srv/user1 chown –R user1:user1 /srv/user1	Allocate the drive area for the user and necessary rights
Ask user to create softlink to the new drive space	Ln –s /srv/user1 userdir	Command issued by user in his own directory creating a soft link. User can specify his own directory name for the extra space.
		User uses userdir to store files