DISK Case 1:

An organization is deploying a new business application in their environment. The new application requires 1TB of storage space for business and application data. During peak workload application is expected to generate 4900 IOPS (I/O per second) with typical I/O size of 4KB.
The available disk drive option is 15,000 rpm drive with 100 GB capacity.
Other specifications of the drives are:
Av. Seek time = 5 millisecond
Data transfer rate = 40MB/sec

Task:

You are asked to calculate the required number of disk drives that can meet both capacity and performance requirements of an application.

Solutions:

1. Calculate time required to perform one I/O, which depends on disk service time. Whereas, Disk service time= Av. seek time + rotational latency + data transfer time

   Av. Seek time (given) = 5 millisecond.

   Rotational latency is ½ of the time taken for full rotation. Since rotation speed is given as 15000 revolutions per min; one revolution will take 1/ (15000/60) in sec.

   Therefore time taken for half revolution is 0.5/ (15000/60) = 2ms.

   Data transfer rate is 40MB/s, therefore transfer of 4KB I/O will take,

   4KB/40MB/s = 0.1ms

   Therefore, time required to perform one I/O is = 5 ms + 2ms + 0.1ms = 7.1 msec

2. Now calculate maximum number of IOPS a disk can perform, which is equal to, 1 / 7.1 ms = 140 IOPS

   For acceptable response time disk controller utilization must be less than 70%, therefore maximum number of IOPS a disk can perform at 70% utilization is 140 X 0.7 = 98 IOPS

3. Now calculate number of disk required to meet:

   a. Application's performance requirement = 4900/98 = 50 disk

   b. Application's capacity requirement = 1TB/ 100 GB = 10 disk

4. Finally, disk required = Maximum (Capacity, Performance)
   = Maximum (10, 50) = 50 disks

RAID Case 1

Business Profile:

A telecom company, involved in mobile wireless services across the country, has about 5000 employees worldwide. This company has 7 regional offices across the country. Although the company is financially doing well, they continue to feel the competitive pressure. As a result, the company needs to ensure that the IT infrastructure takes advantage of fault tolerant features.

Current Configuration and Challenges:

- The company uses different applications for communication, accounting, and management. All the applications are hosted on individual servers with disks configured as RAID 0.
- All financial activity is managed and tracked by a single accounting application. It is very important for the accounting data to be highly available.
- The application performs around 15% random write operations and the remaining 85% are random reads.
- The accounting data is currently stored on a 5-disk RAID 0 set. Each disk has an advertised formatted capacity of 200 GB and the total size of their files is 730 GB.
- The company performs nightly backups and removes old information — so the amount of data is unlikely to change much over the next 6 months.

The company is approaching the end of the financial year and the IT budget is depleted. It won’t be possible to buy even one new disk drive.

Tasks:

1. Recommend a RAID level that the company can use to restructure their environment fulfilling their needs.
2. Justify your choice based on cost, performance, and availability of the new solution.

Solutions:

First, look at the formatted capacity of the disks. A 200 GB disk holds only 186.3 GB of user data. The total size of customer data is 730 GB, which will fit on 4 disks. Therefore, we can consider a solution which uses parity-based RAID – RAID 3 or RAID 5. RAID 3 is useful only in environments where data access will be in large, sequential blocks; so we exclude it here. RAID 5 is the only solution that will not require purchasing of extra disks. As the proportion of writes does not exceed 25%, RAID 5 should perform reasonably well.

We recommend reconfiguring the disks as a RAID 5 set.

RAID level to use:	RAID 5
Advantages:	Low cost of data protection
Disadvantages:	High overhead due to rebuilt operation if a disk fails.

RAID Case 2

Business Profile:

A telecom company, involved in mobile wireless services across the country, has about 5000 employees worldwide. This company has 7 regional offices across the country. Although the company is financially doing well, they continue to feel the competitive pressure. As a result, the company needs to ensure that the IT infrastructure takes advantage of fault tolerant features.

Current Configuration and Challenges:

- The company uses an accounting application that is hosted on an individual server with disks configured as RAID 0.
- It is now the beginning of a new financial year and the IT department has an increased budget. You are called in to recommend changes to their database environment.
- You investigate their database environment closely and observe that the data is stored on a 6-disk RAID 0 set. Each disk has an advertised formatted capacity of 200 GB and the total size of their files is 900 GB.
- The amount of data is likely to change by 30 % over the next 6 months and your solution must accommodate this growth.
- The application performs around 40% write operations and the remaining 60 % are reads.

Tasks:

1. Recommend a RAID level that the company can use to restructure their environment and fulfill their needs.
2. What is the cost of the new solution?
3. Justify your choice based on cost, performance, and data availability of the new solution.

Note: A new 200 GB disk drive costs $1000. The controller can handle all commonly used RAID levels, so will not need to be replaced.

Solution:

Each 200 GB drive can hold 186.3 GB of data. There is currently 900 GB of data, which will increase to 1170 GB in the next 6 months. That amount of data will fit on 7 disks, with space left over.
The environment uses a high proportion of writes, so parity-based RAID is not an option. RAID 1 will not provide required capacity, so our choice is RAID 1+0. This RAID level uses mirroring and striping. So, for the 1170 GB of data, we need 7 disk pairs – 14 disks.

We already have 6 disks. So, we need to purchase an additional 8, for a total cost of $8000.

RAID level to use:	RAID 1+0
Advantages:	Excellent protection, very good performance in environments with a high proportion of writes Minimal disruption if a disk failure occurs
Disadvantages:	Highest cost of all RAID solutions