**Home Assignment**

Microimage Mobile Media (Pvt) Ltd

1. How Hashmaps work internally ?

It is one of the most popular Collection classes in Java which internally uses HashTable implementation.

HashMap stores map items in its static inner class Node<K,V>. This indicates that each hashMap entry is a Node. HashMap utilizes the hashCode of the key Object internally, and the hash function uses this hashCode to locate the index of the bucket where the new item may be inserted.

HashMap has several buckets, each of which refers to a Singly Linked List, which stores the entries (nodes).

After the hash function has identified the bucket using hashcode, hashCode is used to see if the bucket already contains a key with the same hashCode or not in the bucket.

If a key with the same hashCode already exists, the equals() function is applied to the keys. If the equals function returns true, it implies that a node with the same key already exists, and the value for that key in the entry(node) is overwritten; otherwise, a new node is generated and added to that bucket's Singly Linked List.

If the bucket identified by the hash function does not contain any keys with the same hashCode, the new Node is added to it.

1. Code conversions in Java
   1. **String to int**

To convert String to int, use Integer.parseInt() which returns primitive int in Java.

* 1. **String to long**

To convert String to long, use Long.parseLong() which returns primitive long in Java.

* 1. **String to float**

To convert String to float, use Float.parseFloat() which returns primitive float in Java.

* 1. **String to Boolean**

To convert String to Boolean, use Boolean.parseBoolean () which returns primitive Boolean, either TRUE or FALSE in Java.

* 1. **String to Date**

To convert a value of String into a Date object.

1. Factory Design Pattern (Demonstration)
2. Bash Script
3. Use of Docker

Docker is an open-source software platform that allows users to develop, deploy, and manage virtualized application containers on a shared operating system using a set of tools. The Docker engine is suitable for lone programmers that want a lightweight, clean environment for testing but do not require sophisticated orchestration.

One underlying operating system is shared by all containers. Containers that migrate across Docker environments with the same OS function without modifications since Docker images contain all the requirements needed to execute code within a container. There can be several usages of Docker, which are,

* Docker can be used as a version control system for your entire app’s operating system.
* When you wish to share/collaborate on your app's operating system with a team, use Docker.
* Docker allows you to execute your code in the same environment as your server on your laptop.
* Docker can be used if your program has to go through numerous development phases.

Docker Hub is a software-as-a-service tool that allows users to publish and distribute container-based programs via a centralized location. Trusted Registry, like Hub, is a repository that provides an additional layer of control and ownership over container image storage and delivery.

Docker Engine's swarm mode allows for cluster load balancing. Users may easily scale up container deployments to many hosts by pooling several Docker hosts resources to operate as one.

Compose is a command-line utility for configuring multi-container application services, viewing container statuses, streaming log output, and running single-instance processes.

Content Trust is a security solution that uses user signatures and image metadata to validate the integrity of remote Docker registries.

1. SQL vs NOSQL databases

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| SQL Databases | NOSQL Databases |
| Relational | Non-relational |
| Have a predefined schema and a structured query language | Have dynamic schemas for unstructured data |
| Databases are vertically scalable | Databases are horizontally scalable |
| Databases are table-based | Databases are document, key-value, graph, or wide-column stores |
| SQL databases are better for multi-row transactions | NoSQL is better for unstructured data like documents or JSON |
|  |  |

1. Immutable vs mutable
2. Horizontal Scaling vs Vertical Scaling
3. How to secure an API endpoint
4. A tag in Git ?