Docker - Complete Guide with Interview Questions

# 🐳 What is Docker?

Docker is an open-source platform used to automate the deployment, scaling, and management of applications inside lightweight, portable, and self-sufficient containers.

## 📦 What is a Container?

A container is a standard unit of software that packages up code and all its dependencies so the application runs quickly and reliably across different computing environments.

# 🔧 How Docker Works (Key Concepts)

* Docker Engine: The runtime that runs and manages containers.
* Docker Images: Read-only templates used to create containers.
* Docker Containers: Running instances of Docker images.
* Dockerfile: A script with instructions to build a Docker image.
* Docker Hub: A cloud-based registry where Docker users can share images.
* Docker Compose: Tool to define and run multi-container Docker applications (via YAML file).

# 📑 Docker Architecture

* Client – CLI (`docker`) to interact with Docker.
* Docker Daemon (Server) – Listens to Docker API requests and manages containers.
* Images – Blueprints for containers.
* Containers – Instances of images.
* Registry – Stores Docker images (e.g., Docker Hub).

# 🚀 Workflow (How Docker Works)

1. Write a Dockerfile – Define app environment and dependencies.
2. Build Image – Run `docker build` to create an image.
3. Run Container – Use `docker run` to create and start a container.
4. Push/Pull Images – Use Docker Hub to share or download images.

# 🧠 Key Points to Remember

* Docker containers are lightweight, portable, and isolated.
* Containers share the host OS kernel, unlike VMs which need full OS.
* Docker improves CI/CD, microservices architecture, and scaling.
* Used with Kubernetes for orchestration in production.

# 🧪 Basic Docker Commands

* docker build -t name . – Build image from Dockerfile
* docker run -d -p 80:80 name – Run container in detached mode
* docker ps – List running containers
* docker stop <id> – Stop a running container
* docker rm <id> – Remove container
* docker images – List all images
* docker rmi <image-id> – Remove image
* docker-compose up – Start multi-container app using Compose

# 💼 Docker Interview Questions and Answers

## What is Docker and why is it used?

Docker is a containerization platform that allows developers to package applications and their dependencies into lightweight containers. It's used to ensure consistency across environments, simplify deployment, and speed up development.

## What is the difference between Docker and a Virtual Machine (VM)?

Docker (Container) is lightweight, shares host OS, and starts in seconds. VMs are heavyweight, need full OS, and take longer to boot.

## What is a Dockerfile?

A Dockerfile is a text document with instructions to build a Docker image. It includes commands like FROM, COPY, RUN, and CMD.

## What is Docker Compose?

Docker Compose is a tool used to define and run multi-container Docker applications using a YAML file.

## How do you manage data in Docker?

Using Volumes or Bind Mounts to persist data beyond container lifecycle.

## What is the difference between CMD and ENTRYPOINT?

CMD provides default command arguments; ENTRYPOINT defines the main command and is not easily overridden.

## How do you secure Docker containers?

Use minimal base images, run as non-root user, limit capabilities, keep images updated, and scan for vulnerabilities.

## What is a Docker Registry?

A storage and distribution system for Docker images. Docker Hub is the default public registry.

## Can a container access the host system?

By default, no. Containers are isolated, but access can be granted via bind mounts or privileged mode.

## How do you monitor Docker containers?

Using docker stats, Prometheus, Grafana, cAdvisor, or orchestrators like Kubernetes.