1. **Describe Cloud Concepts**
2. **Describe Azure Architecture and Services**
3. **Describe Azure Management and Governance**

Domain 1: Describe Cloud Concepts

This section is about the "big ideas" of the cloud.

What is Cloud Computing?

- **Simple Idea:** Instead of buying your own powerful computers and hard drives (which is expensive!), you **rent** them from someone else (like Microsoft) over the internet.
- **Key Benefits (The "abilities"):**
    - **High Availability:** Services are always on and running. They don't crash.
    - **Scalability:** The ability to add more power when you need it.
        - **Scale Up (Vertical):** Make one server stronger (more CPU/RAM).
        - **Scale Out (Horizontal):** Add *more* servers (e.g., go from 2 servers to 10).
    - **Elasticity:** The cloud *automatically* scales out (adds servers) when it's busy and scales in (removes servers) when it's quiet. **You only pay for what you use.**
    - **Fault Tolerance:** If one part fails, a backup part takes over instantly. You don't even notice.
    - **Agility:** You can build and deploy new apps in minutes, not weeks.

Spending Models: CapEx vs. OpEx

This is a *guaranteed* exam topic.

- **CapEx (Capital Expenditure):**
    - **What it is:** Paying for physical things (like buildings, servers) **up front**.
    - **Analogy: Buying a car.** You pay a huge amount of money today.
    - **This is the *old* way (on-premises).**
- **OpEx (Operational Expenditure):**
    - **What it is:** Paying for a service as you use it.
    - **Analogy: Renting a car or using a taxi.** You pay only for what you use, when you use it.
    - **This is the *cloud* way.**

Cloud Models (The 3 Flavors)

- **Public Cloud:**
    - **What it is:** You rent services from a provider (like Microsoft Azure) who also rents to other people. You share the hardware.
    - **Pros:** Cheapest, no maintenance, endless scalability.
- **Private Cloud:**

    - **What it is:** You build your *own* cloud in your *own* datacenter.
    - **Pros:** You have total control and the highest security.
    - **Cons:** Very expensive (all CapEx), and *you* have to manage everything.
- **Hybrid Cloud:**
    - **What it is:** You use **both** the Public Cloud and a Private Cloud, and connect them.
    - **Pros:** The "best of both worlds." You can keep private data on-premises (Private) but use the cloud's power for big jobs (Public).

Cloud Service Types (The "Pizza as a Service" Analogy)

This is the most important concept in Domain 1.

- **IaaS (Infrastructure as a Service):**
    - **The Pizza:** Microsoft gives you the **kitchen, oven, and gas** (the servers, storage, and networking).
    - **You Manage:** You have to **install the operating system (OS)**, manage all the software, and make the pizza.
    - **Key Service: Azure Virtual Machines (VMs)**.
- **PaaS (Platform as a Service):**
    - **The Pizza:** Microsoft manages the kitchen, oven, *and* the **OS**.
    - **You Manage:** You just bring your **pizza recipe and ingredients** (your code and data). You don't worry about updating Windows.
    - **Key Services: Azure SQL Database, Azure App Service** (for websites).
- **SaaS (Software as a Service):**
    - **The Pizza:** You just **buy the finished pizza**. It's delivered to you.
    - **You Manage:** Nothing. You just log in and use the software.
    - **Key Services: Microsoft 365, Office 365, Gmail.**
- **Serverless:**
    - **What it is:** A special type of PaaS. Your code *only* runs when it's needed and then shuts off.
    - **Analogy:** You only pay for the oven *for the 10 minutes* it's on to cook the pizza.
    - **Key Service: Azure Functions**.

Domain 2: Describe Azure Architecture & Services

This is the biggest section, all about the "tools" and "building blocks."

The "Blueprint" of Azure (Core Architecture)

- **Regions:** An Azure Region is a **group of datacenters** in a specific location (e.g., "East US").
- **Availability Zones (AZs):**
    - **What it is: Separate physical buildings** *within one* Azure Region. Each has its own power, cooling, etc.

    - **Why?:** This protects you from an *entire building* failing (like a fire). Your app will stay running from another AZ.
- **Region Pairs:**
    - **What it is:** A "buddy" region in the same country (but far away) that is paired with your region.
    - **Why?:** For **Disaster Recovery**. If a natural disaster (like a hurricane) destroys the *entire* "East US" region, your data is safely backed up to its pair (e.g., "West US").

Core Architectural Components (How you organize your stuff)

- **Resource:** The "tool" itself (e.g., a VM, a database, a VNet).
- **Resource Group (RG):**
    - **What it is:** A **folder** or **box** to hold all the resources for one application.
    - **Rule: Everything must live inside a Resource Group.**
    - **Example:** A "Website" RG holds your VM, your database, and your network. If you delete the RG, you delete everything inside it.
- **Subscription:**
    - **What it is:** The "credit card" level. It's how you pay your bill. A subscription is a container for all your Resource Groups.
- **Management Group:**
    - **What it is:** A "big box" to hold **multiple Subscriptions**.
    - **Why?:** A big company can use this to organize its "IT Dept" subscription and its "Sales Dept" subscription under one set of rules.

The Hierarchy: Management Group > Subscription > Resource Group > Resource

Core Azure Services (The "Tools" to know)

Compute (The "Brains")

- **Azure Virtual Machines (VMs):** Your own Windows or Linux server in the cloud (IaaS).
- **Azure Container Instances (ACI):** The fast, simple way to run one "fishbowl" (container).
- **Azure Kubernetes Service (AKS):** The "pet store manager" to control *thousands* of containers (orchestration).
- **Azure Functions:** Serverless. Runs small pieces of code in response to an event (e.g., "When someone uploads a picture, run this code to resize it").
- **Azure Virtual Desktop (AVD):** Lets your employees access a Windows 10/11 desktop in the cloud from anywhere.

Networking (The "Pipes")

- **Virtual Network (VNet):** Your own private, isolated network in Azure.
- **VPN Gateway:** A secure, encrypted **tunnel** to connect your office network to your Azure VNet.
- **Azure Load Balancer:** A "traffic cop" that spreads traffic evenly across your VMs to prevent overload.

- **Azure Application Gateway:** A *smart* traffic cop (a "Layer 7" balancer) that can read web traffic (HTTP) and make smart routing decisions.

Storage (The "Shelves")

- **Azure Blob Storage:** "Blob" means Binary Large Object. This is for *unstructured* files like **pictures, videos, and documents.**
- **Azure Disk Storage:** The virtual hard drive (SSD or HDD) that you attach to your VMs.
- **Azure Files:** A shared network drive in the cloud. Multiple VMs can connect to it at the same time.

Databases (The "Filing Cabinets")

- **Azure SQL Database:** A powerful, fully-managed (PaaS) version of Microsoft SQL Server.
- **Azure Cosmos DB:** A super-fast, **globally-distributed**, multi-model database. (Keywords: **global, low-latency**).
- **Azure Database for MySQL/PostgreSQL:** PaaS services for running these other popular open-source databases.

Other Big Services

- **IoT Hub:** A service to securely connect and manage **"Internet of Things" devices** (like smart thermostats, factory sensors, etc.).
- **Azure Synapse Analytics:** A "big data" service. It's a **data warehouse** for running massive analysis on huge datasets.
- **Azure Machine Learning (ML):** A workspace for data scientists to build, train, and deploy AI models.
- **Azure Marketplace:** The "app store" where you can buy and deploy pre-built apps and services from Microsoft and other companies.

Domain 3: Describe Azure Management & Governance

This section is about security, rules, and monitoring.

Security & Identity (The "Security Guards")

- **Microsoft Entra ID (formerly Azure AD):**
    - **What it is:** The **"security guard at the front door"** for all of Azure and Microsoft 365.
    - **It controls IDENTITY.** It handles:
        - **Authentication: Proving who you are** (Username + Password).
        - **Authorization: What you are allowed to do** (e.g., you are "authorized" to read files, but not delete them).
- **Multi-Factor Authentication (MFA):** Proving who you are in *more than one way* (e.g., password + a code on your phone).

- **Conditional Access:** A "smart rule" for the security guard. **(Example: IF user is in North Korea, THEN block access).**
- **Azure Key Vault:** A secure "safe" for storing secrets like passwords, keys, and certificates.

Governance (The "Rulebook")

- **Azure Policy:**
  - **What it is:** The **"rulebook"** for your Azure environment.
  - **What it does:** It **enforces** rules. (Example: "You are *not allowed* to create VMs in the 'Europe' region").
- **Role-Based Access Control (RBAC):**
  - **What it is:** A set of **"job titles"** that define what you can do.
  - **What it does:** It *grants permissions*. (Example: The **"Reader"** role lets you *see* resources but not change them. The **"Contributor"** role lets you create and change them).
  - **Policy vs. RBAC:** Policy *denies* things (it's a "block list"). RBAC *allows* things (it's an "allow list").
- **Resource Locks:**
  - **What it is:** A "padlock" you put on a resource.
  - **What it does:** Prevents accidental deletion. A `CanNotDelete` lock is the most common.
- **Tags:**
  - **What it is: "Sticky notes"** (Key-Value pairs) you put on resources.
  - **Why?:** For organizing and billing. (Example: `Department: Sales` or `Project: Blue`).

Monitoring (The "Security Cameras")

- **Azure Monitor:**
  - **What it is:** The main "camera system" that **collects** all the logs and performance metrics from your *entire* Azure environment.
- **Application Insights:**
  - **What it is:** A special "camera" that watches your **application's code** to find bugs and performance problems (this is an **APM**, or Application Performance Management tool).
- **Azure Service Health:**
  - **What it is:** A "status page" that tells you if **Microsoft is having a problem** (e.g., "The East US region is down").
- **Log Analytics:**
  - **What it is:** The **"video recorder"** (a database) where all the logs from Azure Monitor are *sent and stored*. You use the **Kusto Query Language (KQL)** to search these logs.

Managing Costs & Planning (The "Wallet")

- **Azure Pricing Calculator:**

    - **What it is:** A **public website** you use to **ESTIMATE** your costs *before* you build anything.
- **Total Cost of Ownership (TCO) Calculator:**
    - **What it is:** A tool to help you **COMPARE** the cost of running your servers on-premises (CapEx) vs. moving to Azure (OpEx). It shows you how much you'll save.
- **Azure Cost Management:**
    - **What it is:** The "banking app" *inside* the Azure portal that shows you **what you are spending** and on which resources.
- **Azure Advisor:**
    - **What it is:** Your **free, personal consultant** inside Azure.
    - **What it does:** It scans your account and gives you recommendations to **save money, improve security, and increase performance.**
- **Service Level Agreement (SLA):**
    - **What it is:** Microsoft's **promise** for how long a service will be "up" (e.g., "99.9%"). If they break this promise, they give you a credit on your bill.