**11.** B. Containers give the most flexibility for using the resources of a cluster efficiently and orchestration platforms reduce the operations overhead, which makes option B correct. Running in a single cluster is not recommended because if the server fails, all services will be down. Using two VMs with one read-only is not useful. Read-only servers are sometimes used with databases, but there was no mention of databases in the question. Using a small VM and upgrading when it is no longer able to keep up with the workload delivers poor-quality service to users and should be avoided.

**12.** D. All of the operations are available to a system administrator after creating a VM, so option D is correct.

**13.** A. Option A is correct; Cloud Filestore is based on Network Filesystem (NSF), which is a distributed file management system. The other options are file systems supported by Linux but are not the foundation of Cloud Filestore.

**14.** A. When you create a network, it is treated as a virtual private cloud, which makes option A correct. Resources are added to the VPC and are not accessible outside the VPC unless you explicitly configure them to be. A subdomain is related to web domains and not related to GPC network configuration. Clusters, such as Kubernetes clusters, may be in your network, but are not a characteristic of the network.

**15.** D. Caches use memory, and that makes them the fastest storage type for reading data, so option D is right. Caches are data stores on the backend of distributed systems, not the clients. A cache would have no effect on client-side JavaScript execution. Caches do not store data in a cache if power is lost; the data would have to be reloaded. Caches can get out of sync with the system of truth because the system of truth could be updated, but the cache may not be updated. Caches have faster read times than SSDs and HDDs.

**16.** B. Option B is correct; cloud providers have large capacity and can quickly allocate those resources to different customers. With a mix of customers and workloads, they can optimize the allocation of resources. Option A is incorrect; cloud providers do not take resources from one customer to give them to another, with the exception of preemptible instances. Option C is incorrect; cloud providers usually offer discounts for increased use.

**17.** C. Specialized services are monitored by Google so users do not have to monitor them; therefore, option C is correct. Specialized services provide a specific compute functionality but do not require the user to configure any resources. They also provide APIs.

**18.** B. Attached drives are block storage devices. Cloud Storage is the object storage service and does not attach directly to a VM. NoSQL is a type of database, not a storage system. Attached drives may be either SSDs or hard drives.

**19.** C. Databases require persistent storage on block devices. Object storage does not provide data block or file system storage, making option C the correct answer. Data storage is not a type of storage system. Caches are often used with databases to improve read performance, but they are volatile and are not suitable for persistently storing data files.

**20.** B. All three services are serverless, so the user does not need to configure VMs; therefore, option B is correct. Cloud Storage is charged based on time and size of data stored. App Engine Standard and Cloud Functions are not restricted to just the Go language.

# Chapter 2: Google Cloud Computing Services

1. C. Cloud Load Balancing distributes workloads within and across regions, provides health checks, and implements autoscaling. Cloud DNS provides domain name services, such as translating a URL like `www.example.com` to an IP address. Cloud Spanner is a distributed relational database but does not implement workload distribution. Cloud CDN distributes content across regions to reduce latency when delivering content to users across the globe.

2. C. App Engine flexible environments allow you to run containers on the App Engine PaaS. Kubernetes Engine is an orchestration platform for running containers. Both provide container management services. The App Engine standard environment runs applications in language-specific sandboxes and is not a general container management system. Cloud Functions is a serverless service for running code in response to events. It does not provide container services.

3. D. Options A and B are both correct answers. The Apigee API platform provides policy-based rate-limiting and routing services to help accommodate spikes in traffic. It also provides OAuth 2.0 and SAML authentication. It does not provide version control; Cloud Source Repositories is the service user for version control.

4. A. Cloud Armor builds on GCP's load balancing services to provide the ability to allow or restrict access based on IP address, deploy rules to counter cross-site scripting attacks, and provide countermeasures to SQL injection attacks. Cloud CDN is a content distribution service, not a security service. Identity Access Management is a security service, but it is for authentication and authorization, not denial-of-service mitigation. Virtual private clouds are used to restrict network access to an organization's resources, but it does not have features to mitigate denial-of-service attacks. Also, Cloud CDN acts as a first line of defense in the case of DDoS attacks.

5. A. This is a good use case for preemptible VMs because they could reduce the cost of running the second application without the risk of losing work. Since tasks are deleted from the queue only after they are completed if a preemptible VM is shut down before completing the task, another VM can perform the task. Also, there is no harm in running a task more than once, so if two VMs do the same task, it will not adversely affect the output of the application. DataProc and Spanner are not appropriate products for this task.

6. B. Cloud Memorystore is the only GCP designed to cache data in memory. Cloud SQL is a relational database service and might be a good option for the backend database. Cloud Spanner is a global relational database and is a good option when you need a globally consistent database. Cloud Datastore is a document database suitable for product catalogs, user profiles, and other semistructured data.

7. D. All three of the services listed, Compute Engine, Cloud Storage, and network firewalls, can be managed and configured using Cloud SDK.

8. D. Cloud Functions is a serverless product, no configuration is required.

**9.** D. The Stackdriver Logging product is used to consolidate and manage logs generated by applications and servers.

**10.** B. The data analytics set of specialized services includes products that help with extraction, transformation, and loading (ETL) and work with both batch and streaming data. The Apigee API platform is used for managing APIs and does not meet the needs described. AI and machine learning might be useful for analyzing data in the data warehouse, but the services in that set are not always helpful for ETL operations. Cloud SDK is used to control services but by itself is not directly able to perform the operations needed.

**11.** B. Bigtable is designed to accept billions of rows of data. Collecting data from 100,000 sensors every 5 seconds will generate 6,000,000 data points every minute, or 8,640,000,000 data points per day. Spanner is a relational database and supports transactions, but they are not needed. Cloud SQL MySQL and Cloud SQL PostgreSQL would be difficult to scale to this level of read and write performance.

**12.** A. Cloud Firestore is a mobile database service that can synchronize data between mobile devices and centralized storage. Spanner is a global relational database for large-scale applications that require transaction support in highly scaled databases. Datastore and Cloud SQL could be used but would require more custom development to synchronize data between mobile devices and the centralized data store.

**13.** B. A computationally intensive application obviously requires high CPUs, but the fact that there are many mathematical calculations indicates that a GPU should be used. You might consider running this in a cluster, but the work is not easily distributed over multiple servers, so you will need to have a single server capable of handling the load. Immediate access to large amounts of data indicates that a high-memory machine should be recommended.

**14.** B. Identities are abstractions of users. They can also represent characteristics of processes that run on behalf of a human user or a VM in the GCP. Identities are not related to VM IDs. Roles are collections of privileges that can be granted to identities. Option D is synonymous with option C.

**15.** C. Cloud Natural Language Processing provides functionality for analyzing text. Cloud Text Miner does not exist. Cloud ML is a general-purpose machine learning service that could be applied to text analysis but would require knowledge of language processing, which the client does not have. Cloud Vision is for image processing.

**16.** B. Both options B and D would meet the need of running Spark, which would give the data scientists access to the machine library they need. However, option D requires that they manage and monitor the cluster of servers, which would require more DevOps and administration work than if they used the Dataproc service. Option C, BigQuery, is a scalable database, not a platform for running Spark. Cloud Spark is a fictitious product and does not exist in the GCP.

**17.** B. Option B is correct. Spanner supports ANSI 2011 standard SQL and global transactions. Cloud SQL supports standard SQL but does not have global transaction. Datastore and Bigtable are NoSQL databases.

18. A. Dataproc is designed to execute workflows in both batch and streaming modes, which makes option A correct. BigQuery is a data warehouse service. Datastore is a document database. AutoML is a machine learning service.

19. C. App Engine standard environment provides a serverless Python sandbox that scales automatically, so option C is correct. App Engine flexible environment runs containers and requires more configuration. Cloud Engine and Kubernetes Engine both require significant management and monitoring.

20. D. Error reporting consolidates crash information, which makes Error Reporting the right answer. Monitoring collects metrics on application and server performance. Logging is a log management service. Dataproc is not part of Stackdriver; it is a managed Hadoop and Spark service.

# Chapter 3: Projects, Service Accounts, and Billing

1. A. Option A, the correct answer, separates the two main applications into their own folders and further allows separating private insurance from government payer, but using folders for each. This satisfies the regulatory need to keep the government payer software isolated from other software. Option B does not include an organization, which is the root of the resource hierarchy. Option C is not flexible with regard to differences in constraints on different applications. Option D is false because option A does meet the requirements.

2. C. Resource hierarchies have a single organization at the root, which makes option C correct. Below that, there are folders that can contain other folders or projects. Folders can contain multiple folders and multiple projects.

3. B. Service accounts are designed to give applications or VMs permission to perform tasks. Billing accounts are for associating charges with a payment method. Folders are part of resource hierarchies and have nothing to do with enabling an application to perform a task. Messaging accounts are a fictitious option.

4. B. Inherited policies can be overridden by defining a policy at a folder or project level. Service accounts and billing accounts are not part of the resource hierarchy and are not involved in overriding policies.

5. E. All of the listed types of constraints are supported in policies.

6. B. Option B is the correct answer because Publisher is not a primitive role. Owner, Editor, and Viewer are the three primitive privileges in GCP.

7. D. Primitive roles only include the Owner, Editor, and View permissions. Predefined roles are designed for GCP products and services, like App Engine and BigQuery. For a custom application, you can create sets of privileges that give the user with that role as much permission as needed but not more.

**8.** D. Users should have only the privileges that are needed to carry out their duties. This is the principle of least privilege. Rotation of duties is another security principle related to having different people perform a task at a different times. Defense in depth is the practice of using multiple security controls to protect the same asset. Option B is not a real security principal.

**9.** A. A resource hierarchy has only one organization, which makes option A correct. You can, however, create multiple folders and projects within a resource hierarchy.

**10.** B. In option B, the correct answer, the billing account is used to specify payment information and should be used to set up automatic payments. Service accounts are used to grant privileges to a VM and are not related to billing and payments. Resource accounts and credit accounts do not exist.

**11.** C. GCP offers a free service level for many products, which makes option C the correct answer. You can use these services without having to set up a billing account. Google charges for serverless products, such as Cloud Functions and App Engine, when customers exceed the amount allowed under the free tier.

**12.** D. Stackdriver Workspaces are linked to projects, not individual resources like VM instances, clusters, or App Engine apps, so option D is correct. Options A, B, and C all incorrectly indicate that Workspaces are associated with individual compute resources.

**13.** D. Large enterprises should use invoicing when incurring large charges, which makes option D the right answer. A self-service account is appropriate only for amounts that are within the credit limits of credit cards. Since the subdivisions are independently managed and have their own budgets, each should have its own billing accounts.

**14.** A. When a user is granted `iam.serviceAccountUser` at the project level, that user can manage all service accounts in the project, so option A is correct. If a new service account is created, they will automatically have privilege to manage that service account. You could grant `iam.serviceAccountUser` to the administrator at the service account level, but that would require setting the role for all service accounts. If a new service account is created, the application administrator would have to grant `iam.serviceAccountUser` to the other administrator on the new service account. `iam.serviceProjectAccountUser` is a fictional role.

**15.** C. When a service account is created, Google generates encrypted keys for authentication, making option C correct. Usernames and passwords are not an option for service accounts. Two-factor authentication is an authentication practice that requires two forms of authentication, such as a username password pair and a code from an authentication device. Biometrics cannot be used by services and is not an option.

**16.** B. Service accounts are resources that are managed by administrators, but they also function as identities that can be assigned roles, which makes option B the correct answer. Billing accounts are not related to identities. Projects are not identities; they cannot take on roles. Roles are resources but not identities. They can take on privileges, but those privileges are used only when they are attached to an identity.

17. B. Predefined roles are defined for a particular product, such as App Services or Compute Engine, so option B is the right answer. They bundle privileges often needed together when managing or using a service. Primitive roles are building blocks for other roles. Custom roles are created by users to meet their particular needs; Application roles is a fictitious role.

18. B. By default all users in an organization can create projects, which makes option B correct. The role `resourcemanager.projects.create` is the role that allows users to create projects. The billing account is not associated with creating projects.

19. D. The maximum number of organizations is determined on a per-account basis by Google, so option D is the correct answer. If you need additional organizations, you can contact Google and ask for an increase in your limit.

20. B. Users with the Organization IAM role are not necessarily responsible for determining what privileges should be assigned to users. That is determined based on the person's role in the organization and the security policies established within the organization, which makes option B correct.

# Chapter 4: Introduction to Computing in Google Cloud

1. B. The App Engine standard environment can run Python applications, which can autoscale down to no instances when there is no load and thereby minimize costs. Compute Engine and the App Engine flexible environment both require more configuration management than the App Engine standard environment. Kubernetes Engine is used when a cluster of servers is needed to support large or multiple applications using the same computing resources.

2. A. Database servers require high availability to respond to queries from users or applications. Preemptible machines are guaranteed to shut down in at most 24 hours. A batch processing job with no fixed time requirements could use preemptible machines as long as the VM is restarted. High-performance computing clusters can use preemptible machines because work on a preemptible machine can be automatically rescheduled for another node on the cluster when a server is preempted. D is incorrect because there is a correct answer in the set of options.

3. A. VMs are created in projects, which are part of the resource hierarchy. They are also located in geographic regions and data centers, so a zone is specified as well. Usernames and admin roles are not specified during creation. The billing account is tied to a project and so does not have to be specified when the VM is created. Cloud storage buckets are created independently of VMs. Not all VMs will make use of storage buckets.

4. C. Compute Engine can run Docker containers if you install Docker on the VM. Kubernetes and the App Engine flexible environment support Docker containers. The App Engine standard environment provides language-specific runtime environments and does not allow customers to specify custom Docker images for use.

5. B. The name of the file that is used to build and configure a Docker container is `Dockerfile`.

6. D. Kubernetes uses 25 percent of memory up to 4GB and then slightly less for the next 4GB, and it continues to reduce the percentage of additional memory down to 2 percent of memory over 128GB.

7. B. Kubernetes provides load balancing, scaling, and automatic upgrading of software. It does not provide vulnerability scanning. GCP does have a Cloud Security Scanner product, but that is designed to work with App Engine to identify common application vulnerabilities.

8. D. The scenario described is a good fit for Kubernetes. Each of the groups of services can be structured in pods and deployed using Kubernetes deployment. Kubernetes Engine manages node health, load balancing, and scaling. App Engine Standard Edition has language-specific sandboxes and is not a good fit for this use case. Cloud Functions is designed for short-running event processing and is not the kind of continuous processing needed in this scenario. Compute Engine could meet the requirements of this use case, but it would require more effort on the part of application administrators and DevOps professionals to configure load balancers, monitor health, and manage software deployments.

9. B. This is an ideal use case for Cloud Functions. The cloud function is triggered by a file upload event. The cloud function calls the image processing service. With this setup, the two services are independent. No additional servers are required. Option A violates the requirement to keep the services independent. Options C and D incur more management overhead and will probably cost more to operate than option B.

10. D. Each invocation of a cloud function runs in a secure, isolated runtime environment. There is no need to check whether other invocations are running. With the Cloud Functions service, there is no way for a developer to control code execution at the process or thread level.

11. A. You would create a custom image after you installed the custom code, in this case the encryption library. A public image does not contain custom code, but it could be used as the base that you add custom code to. Both CentOS and Ubuntu are Linux distributions. You could use either as the base image that you add custom code to, but on their own, they do not have custom code.

12. B. Projects are the lowest level of the resource hierarchy. The organization is at the top of the hierarchy, and folders are between the organization and projects. VM instances are not part of the resource hierarchy.

13. D. All Google regions have the same level of service level agreement, so reliability is the same. Costs may differ between regions. Regulations may require that data stay within a geographic area, such as the European Union. Latency is a consideration when you want a region that is close to end users or data you will need is already stored in a particular region.

14. B. Compute Engine Admin Role is the role that gives users complete control over instances. Options A and C are fictitious roles. Compute Engine Security Admin gives users the privileges to create, modify, and delete SSL certificates and firewall rules.

15. D. Preemptible VMs will be terminated after 24 hours. Google does not guarantee that preemptible VMs will be available. Once an instance is started as a preemptible machine, it cannot migrate to a regular VM. You could, however, save a snapshot and use that to create a new regular instance.

16. C. Custom VMs can have up to 64 CPUs and up to 6.5GB of memory per vCPU.

17. C. The C programming language is not supported in the App Engine standard environment. If you need to run a C application, it can be compiled and run in a container running in the App Engine flexible environment.

18. B. Kubernetes reserves CPU capacity according to the following schedule:
    1. 6 percent of the first core
    2. 1 percent of the next core (up to two cores)
    3. 0.5 percent of the next two cores (up to four cores)
    4. 0.25 percent of any cores above four cores

19. B. The only states a Kubernetes deployment can be in are progressing, completed, and failed.

20. A. Cloud Functions is best suited for event-driven processing, such as a file being uploaded to Cloud Storage or an event being writing to a Pub/Sub queue. Long-running jobs, such as loading data into a data warehouse, are better suited to Compute Engine or App Engine.

# Chapter 5: Computing with Compute Engine Virtual Machines

1. C. You should verify the project selected because all operations you perform will apply to resources in the selected project, making option C the correct answer. You do not need to open Cloud Shell unless you want to work with the command line, and if you did, you should verify that the project is correctly selected first. Logging into a VM using SSH is one of the tasks that requires you to be working with the correct project, so logging in via SSH should not happen before verifying the project. The list of VMs in the VM Instance window is a list of VMs in the current project. You should verify which project you are using to ensure you are viewing the set of VMs you think you are using.

2. A. You will need to set up billing if it is not already enabled when you start using the console, so option A is the right answer. You may create a project, but you will be able to do this only if billing is enabled. You do not need to create a storage bucket to work with the console. Specifying a default zone is not a one-time task; you may change zones throughout the life of your project.

3. B. The name of the VM, the region and zone, and the machine type can all be specified in the console along with other parameters, so option B is correct. Option A is missing required parameters. A CIDR block is a range of IP addresses that is associated with a subnet and not needed to create a VM. An IP address is assigned automatically so it is not required.

4. B. Different zones may have different machine types available, so you will need to specify a region first and then a zone to determine the set of machine types available. If the machine type does not appear in the list, it is not available in that zone. This makes option B the correct answer. Options A and C are incorrect. Subnets and IP addresses are not related to the machine types available. Unless you are specifying a custom machine type, you do not specify the amount of memory; that is defined by the machine type, so option D is incorrect.

5. C. Labels and descriptions are for helping us track our own attributes of resources; GCP does not need them to perform its tasks. As the number of servers grows, it can become difficult to track which VMs are used for which applications and services, so option C is the correct answer. Labels and a general description will help administrators track numbers of VMs and their related costs. Options A and B are used for security and storage but do not help with managing multiple VMs. Option D is only partially correct. Descriptions are helpful but so are labels.

6. A. The Availability Policy section within the Management tab is where you set preemptibility, so option A is correct. Identity And API Access is used to control the VM's access to Google Cloud APIs and which service account is used with the VM. Sole Tenancy is used if you need to run your VMs on physical servers that only run your VMs. Networking is used to set network tags and change the network interface.

7. B. Shield VM is an advanced set of security controls that includes Integrity Monitoring, a check to ensure boot images have not been tampered with, which makes option B the right answer. Firewalls are used to control ingress and egress of network traffic to a server or subnet. Project-wide SSH keys are used for authenticating users across servers within a project. Boot disk integrity check is a fictional feature.

8. C. Block size is not an option in the Additional Disks dialog, so option C is correct. Encryption key management, disk type, and the option of specifying a source image are all available options.

9. B. Using version-controlled scripts is the best approach of the four options. Scripts can be documented with reasons for the changes and they can be run repeatedly on different machines to implement the same change. This reduces the chance of error when manually entering a command. Option A does not help to improve documenting why changes were made. Option C could help improve documentation, but executable scripts are precise and accurate reflections of what was executed. Notes may miss details. Option D is not advisable. You could become a bottleneck to making changes, changes cannot be made when you are unavailable, and your memory may not be a reliable way to track all configuration changes.

**10.** A. `gcloud compute instances` is the start of commands for administering Compute Engine resources, making option A the right answer. Option B, `gcloud instances`, is missing the compute keyword that indicates we are working with Compute Engine. Option C has switched the order of `compute` and `instances`. Option D is false because option A is the correct answer.

**11.** B. Option B follows the pattern of the `glcoud` command, which is hierarchical and starts with the `glcoud` name of the service, in this case `compute` for Compute Engine, followed by the next level down, which in this case is `instances`. Finally, there is the action or verb, in this case `list`. Option A is missing the term `instances` to indicate you are working with VM instances. Option C is missing the `compute` keyword to indicate you are working with Compute Engine. Option D is missing the `compute instance` keyword and has switched the order of `instances` and `list`.

**12.** B. The correct format is to use the `--labels` parameter and specify the key followed by an equal sign followed by the value in option B. Options A and C have the wrong character separating the key and value. Option D is incorrect because it is possible to specify labels in the command line.

**13.** C. The two operations you can specify when using the book disk configuration are adding a new disk and attaching an existing disk, so option C is correct. Reformatting an existing disk is not an option, so options A, B, and D cannot be the correct answer.

**14.** B. 10 GB of data is small enough to store on a single disk. By creating an image of a disk with the data stored on it, you can specify that source image when creating a VM. Option A would require the data scientist to copy the data from Cloud Storage to a disk on the VM. Option C would similarly require copying the data. Option D would load data into a database, not a file system as specified in the requirements.

**15.** B. In the Network tab of the VM form, you can add another network interface, so option B is correct. GCP sets the IP address, so option A is incorrect. There is no option to specify a router or change firewall rules on the Network tab, so options C and D are incorrect.

**16.** A. The correct option is `boot-disk-type`, which is option A. The other three options are not parameters to the `gcloud compute instances` command.

**17.** A. Option A is the correct command. It is the only option that includes a correct machine type and properly specifies the name of the instance. Option B uses the `--cpus` parameter, which does not exist. Option C uses the parameter `instance-name`, which does not exist. The instance name is passed as an argument and does not need a parameter name. Option D is incorrect because `machine type n1-4-cpu` is not a valid machine type.

**18.** C. Option C is the correct command, which is `gcloud compute instances`, to indicate you are working with VMs, followed by the `stop` command and the name of the VM. Option A is incorrect because `halt` is not an option. Option B is incorrect because `-terminate` is not a parameter. Option D is missing the word `instances`, which indicates you are working with VMs.

19. B. SSH is service for connecting to a remote server and logging into a terminal window. Once logged in, you would have access to a command line, so option B is the right answer. FTP is a file transfer protocol and does not allow you to log in and perform system administration tasks. RDP is a protocol used to remotely access Windows servers, not Ubuntu, which is a Linux distribution. `ipconfig` is a command-line utility for configuring IP stacks on a device and does not allow you to log into a remote server.

20. A. All of the statements in option A are true and relevant to billing and costs. Option B is correct that VMs are billed in 1-second increments, but the only preemptible VMs are shut down within 24 hours of starting. Option C is incorrect because discounts are not limited to some regions. Option D is incorrect because VMs are not charged for a minimum of 1 hour.

# Chapter 6: Managing Virtual Machines

1. A. The Compute Engine page is where you have the option of creating a single VM instance, so option A is the correct answer. App Engine is used for containers and running applications in language-specific runtime environments. Kubernetes Engine is used to create and manage Kubernetes clusters. Cloud Functions is where you would create a function to run in Google's serverless cloud function environment.

2. B. Instances can be stopped, and when they are, then you cannot connect to them via SSH, which makes option B the correct answer. Starting the instance will enable SSH access. Option A is not correct because you can log into preemptible machines. Option C is incorrect because there is no No SSH option. Option D is incorrect because the SSH option can be disabled.

3. B. The Reset command can be used to restart a VM; thus, option B is correct. The properties of the VM will not change, but data in memory will be lost. There is no Reboot, Restart, Shutdown, or Startup option in the console.

4. C. Labels, members of a managed instance group, and status are all available for filtering, so option C is the correct answer. You can also filter by internal IP, external IP, zone, network, deletion protection, and member of a managed or unmanaged instance group.

5. A. To function properly, the operating system must have GPU libraries installed, so option A is correct. The operating system does not have to be Ubuntu based, and there is no need to have at least eight CPUs in an instance before you can attach and use a GPU. Available disk space does not determine if a GPU is used or not.

6. A. If you add a GPU to a VM, you must set the instance to terminate during maintenance, which makes option A the correct response. This is set in the Availability Policies section of the VM configuration form. The instance does not need to be preemptible and it can have non-boot disks attached. The instance is not required to run Ubuntu 14.02 or later.

7. B. When you first create a snapshot, GCP will make a full copy of the data on the persistent disk. The next time you create a snapshot from that disk, GCP will only copy the data that has changed since the last snapshot. Option A is incorrect; GCP does not store a full copy of the second snapshot. Option C is incorrect; the first snapshot is not deleted automatically. Option D is incorrect, subsequent snapshots do not incur 10 percent overhead.

8. D. To work with snapshots, a user must be assigned the Compute Storage Admin role, which makes option D the correct answer. The other options are fictitious roles.

9. C. Images can be created from four sources, namely, disks, snapshots, cloud storage files, or another image, so option C is the right answer. Database export files are not sources for images.

10. B. Deprecated marks the image as no longer supported and allows you to specify a replacement image to use going forward, making option B the correct answer. Deprecated images are available for use but may not be patched for security flaws or have other updates. The other options are fictitious features of images.

11. C. The base command for working with instances is `gcloud compute instances`, which makes option C the correct answer. The `list` command is used to show details of all instances. By default, `output` is in human-readable form, not `json`. Using the `--format json` option forces the output to be in JSON format. `--output` is not a valid option.

12. B. `--async` causes information about the start process to be displayed; therefore, option B is correct. `--verbose` is an analogous parameter in many Linux commands. `--describe` provides details about an instance but not necessarily the startup process. `--details` is not a valid parameter.

13. C. The command to delete an instance is `gcloud compute instances delete` followed by the name of the instance, so option C is correct. Option A is incorrect because there is no `instance` parameter. Option B is incorrect because that command stops but does not delete the instance. Option D is missing `instances` in the command, which is required to indicate what type of entity is being deleted.

14. A. `gcloud compute instances` is the base command followed by `delete`, the name of the instance, and `--keep-disks=boot`, so option A is correct. There is no `--save-disk` parameter. Option C is wrong because `filesystem` is not a valid value for the `keep-disk` parameter. Option D is missing the `instances` option which is required in the command.

15. B. The correct answer is option B, which is to use the `describe` command. Option A will show some fields but not all. Options C and D are incorrect because there is no `detailed` parameter.

16. B. Instance groups are sets of VMs that can be configured to scale and are used with load balancers, which contribute to improving availability, so option B is correct. Preemptible instances are not highly available because they can be shut down at any time by GCP. Cloud Storage is not a Compute Engine component. GPUs can help improve throughput for math-intensive operations but do not contribute to high availability.

17. B. An instance group template is used to specify how the instance group should be created, which makes option B the correct answer. Option A is incorrect because instances are created automatically when an instance group is created. Boot disk images and snapshots do not have to be created before creating an instance group.

18. B. The command to delete an instance group is `gcloud compute instance-template delete`, so option B is correct. Option A incorrectly includes the term `instances`. Option C is in incorrect order. Option D is wrong because `instance-template` is in the wrong position and is plural in the option.

19. C. You can configure an autoscaling policy to trigger adding or removing instances based on CPU utilization, monitoring metric, load balancing capacity, or queue-based workloads. Disk, network latency, and memory can trigger scaling if monitoring metrics on those resources are configured. So, option C is correct.

20. B. Unmanaged instance groups are available for limited use cases such as this. Unmanaged instance groups are not recommended in general. Managed instance groups are the recommended way to use instance groups, but the two different configurations prevents their use. Preemptible instances and GPUs are not relevant to this scenario.

# Chapter 7: Computing with Kubernetes

1. C. Kubernetes creates instance groups as part of the process of creating a cluster, which makes option C the correct answer. Stackdriver, not instance groups, is used to monitor the health of nodes and to create alerts and notifications. Kubernetes creates pods and deployments; they are not provided by instance groups.

2. A. A Kubernetes cluster has a single cluster master and one or more nodes to execute workloads, so option A is the correct answer. Stackdriver is not part of the Kubernetes cluster; it is a separate GCP service. Kubernetes does not require instances with at least four vCPUs; in fact, the default node configuration uses one vCPU.

3. C. Pods are single instances of a running process in a cluster, so option C is correct. Pods run containers but are not sets of containers. Application code runs in containers that are deployed in pods. Pods are not controllers, so they cannot manage communication with clients and Kubernetes services.

4. B. Services are applications that provide API endpoints that allow applications to discover pods running a particular application, making option B correct. Options A and C, if they could be coded using the API designed for managing clusters, would require more code than working with services and are subject to changes in a larger set of API functions. Option D is not an actual option.

5. C. ReplicaSets are controllers that are responsible for maintaining the correct number of pods, which makes option C the correct answer. Deployments are versions of application code running on a cluster. Stackdriver is a monitoring and logging service that monitors but does not control Kubernetes clusters. Jobs is an abstraction of workloads and is not tied to the number of pods running in a cluster.

6. B. Multizone/multiregion clusters are available in Kubernetes Engine and are used to provide resiliency to an application, so option B is correct. Option A refers to instance groups that are a feature of Compute Engine, not directly of Kubernetes Engine. Option C is incorrect; regional deployments is a fictitious term. Load balancing distributes load and is part of Kubernetes by default. If load is not distributed across zones or regions, it does not help to add resiliency across data centers.

7. A. Option A is the best answer. Starting with an existing template, filling in parameters, and generating the `gcloud` command is the most reliable way. Option D may work, but multiple parameters that are needed for your configuration may not be in the script you start with. There may be some trial and error with this option. Options B and C may lead to a solution but could take some time to complete.

8. A. The correct command is option A. Option B has `beta` in the wrong position. Option C is missing `beta`. Option D is missing the `--num-nodes` parameter name.

9. C. Time to Live is not an attribute of deployments, so option C is the correct answer. Application name, container image, and initial command can all be specified.

10. B. Deployment configuration files created in Cloud Console are saved in YAML format. CSV, TSV, and JSON are not used.

11. C. The `kubectl` command is used to control workloads on a Kubernetes cluster once it is created, so option C is correct. Options A and B are incorrect because `gcloud` is not used to manipulate Kubernetes processes. Option D is wrong because `beta` is not required in `kubectl` commands.

12. C. Option C is the correct command. Option A uses the term `upgrade` instead of `scale`. Option B incorrectly uses `gcloud`. Option D uses the incorrect parameter pods.

13. D. Stackdriver is a comprehensive monitoring, logging, alerting, and notification service that can be used to monitor Kubernetes clusters.

14. B. Workspaces are logical structures for storing information about resources in a project that are being monitored, so option B is correct. Stackdriver works with logs, but a log is not required before starting to use Stackdriver. Pods and ReplicaSets are part of Kubernetes, not Stackdriver.

15. C. The Stackdriver Instance Detail page includes time-series charts on CPU usage, network traffic, and disk I/O.

16. B. When creating an alert policy, you can specify conditions, notifications, and documentation, making option B the correct answer. Options A and D are incorrect because there is no Time to Live attribute on policies. Option C is wrong because it does not include notifications and documentation.

17. A. Alerts can have multiple channels, so Option A is correct. Channels include email, webhooks, and SMS text messaging as well as third-party tools such as PagerDuty, Campfire, and Slack. There is no need for multiple alerts with individual notifications. Option C is ad hoc and would require additional maintenance overhead. Option D does not meet requirements.

18. B. Alerts are assigned to instances or sets of instances; therefore, option B is correct. Option A is incorrect because it does not include groups. Option C is incorrect because it does not include instances. Option D is wrong because alerts are not assigned to pods.

19. A. All interactions with the cluster are done through the master using the Kubernetes API. If an action is to be taken on a node, the command is issued by the cluster master, so option A is the correct answer. Options B and D are incorrect because they are controllers within the cluster and do not impact how commands are received from client devices. Option C is incorrect because `kubectl`, not `gcloud`, is used to initiate deployments.

20. A. Services provide a level of indirection to accessing pods. Pods are ephemeral. Clients connect to services, which can discover pods. ReplicaSets and StatefulSets provide managed pods. Alerts are for reporting on the state of resources.

# Chapter 8: Managing Kubernetes Clusters

1. B. When on the Cloud Console pages, you can click the cluster name to see a Details page, so option B is the correct answer. Typing the name of cluster in the search bar does not always return cluster details; it can return instance group details. There is no such command as `gcloud cluster details`.

2. D. You can find the number of vCPUs on the cluster listing in the Total Cores column or on the Details page in the Node Pool section in the size parameter, making option D correct. The Labels section does not have vCPU information.

3. B. The correct command includes `gcloud container` to describe the service, `clusters` to indicate the resource you are referring to, and `list` to indicate the command, which makes option B the correct answer. Options A and C are not valid commands.

4. B. It is likely you do not have access privileges to the cluster. The `gdcloud container clusters get-credentials` command is the correct command to configure `kubectl` to use GCP credentials for the cluster, so option B is the right option. Options A, C, and D are invalid commands.

5. C. Clicking the Edit button allows you to change, add, or remove labels, so option C is the correct answer. The Connect button is on the cluster listing page, and the Deploy button is for creating new deployments. There is no way to enter labels under the Labels section when displaying details.

6. D. When resizing, the `gcloud container clusters resize` command requires the name of the cluster and the node pool to modify. The size is required to specify how many nodes should be running. Therefore, option D is correct.

7. B. Pods are used to implement replicas of a deployment. It is a best practice to modify the deployments, which are configured with a specification of the number of replicas that should always run, so option B is the correct answer. Option A is incorrect; you should not modify pods directly. Options C and D are incorrect because they do not change the number of pods running an application.

8. C. Deployments are listed under Workloads, making option C the correct answer. The Cluster option shows details about clusters but does not have details on deployments. Storage shows information about persistent volumes and storage classes. Deployments is not an option.

9. B. There are four actions available for deployments (Autoscale, Expose, Rolling Update, and Scale), so option B is correct. Add, Modify, and Delete are not options.

10. C. Since deployments are managed by Kubernetes and not GCP, we need to use a `kubectl` command and not a `gcloud` command, which makes option C correct. Option D is incorrect because it follows the `gcloud` command structure, not the `kubectl` command structure. The `kubectl` command has the verb, like `get`, before the resource type, like `deployments`, for example.

11. D. You can specify container image, cluster name, and application name along with the labels, initial command, and namespace; therefore, option D is the correct answer.

12. A. The Deployment Details page includes services, so option A is the correct answer. Containers are used to implement services; service details are not available there. The Clusters Detail page does not contain information on services running in the cluster.

13. A. `kubectl run` is the command used to start a deployment. It takes a name for the deployment, an image, and a port specification. The other options are not valid `kubectl` commands.

14. A. Option A shows the correct command, which is `kubectl delete service ml-classifier-3`. Option B is missing the service term. Options C and D cannot be correct because services are managed by Kubernetes, not GCP.

15. C. The Container Registry is the service for managing images that can be used in other services, including Kubernetes Engine and Compute Engine, making option C correct. Both Compute Engine and Kubernetes Engine use images but do not manage them. There is no service called Container Engine.

16. A. Images are managed by GCP, so the correct command will be a `gcloud` command, so option A is the correct answer. Option B is incorrect because the verb is placed before the resource. Options C and D are incorrect because `kubectl` is for managing Kubernetes resources, not GCP resources like container images.

17. B. The correct command is `gcloud container images describe`, which makes option B the right answer. `describe` is the `gcloud` verb or operation for showing the details of an object. All other options are invalid commands.

18. B. The `kubectl expose deployment` command makes a service accessible, so option B is the correct answer. IP addresses are assigned to VMs, not services. The command `gcloud` does not manage Kubernetes services, so option C is incorrect. Option D is incorrect because making a service accessible is not a cluster-level task.

19. B. Autoscaling is the most cost-effective and least burdensome way to respond to changes in demand for a service, so option B is the correct answer. Option A may run nodes even when they are not needed. Option C is manually intensive and requires human intervention. Option D reduces human intervention but does not account for unexpected spikes or lulls in demand.

20. B. Cloud engineers working with Kubernetes will need to be familiar with working with clusters, nodes, pods, and container images. They will also need to be familiar with deployment. Option B is the correct answer because the other options are all missing an important component of Kubernetes that cloud engineers will have to manage.

# Chapter 9: Computing with App Engine

1. B. Versions support migration. An app can have multiple versions, and by deploying with the `--migrate` parameter, you can migrate traffic to the new version, so option B is the correct answer. Services are a higher-level abstraction and represent the functionality of a microservice. An app may have multiple services, but they serve different purposes. Instances execute code in a version. Instances may be added and removed as needed, but they will run only one version of a service. Instance groups are part of Compute Engine and are not an App Engine component.

2. A. Autoscaling enables setting a maximum and minimum number of instances, which makes option A correct. Basic scaling does not support maximum and minimum instances. Option C is not recommended because it is difficult to predict when load will peak and even if the schedule is predictable today, it may change over time. Option D is wrong; there is no instance detection option.

3. B. Application is the top-level component, so option B is the correct answer. Applications have one or more services. Services have one or more versions. Versions are executed on one or more instances when the application is running.

4. B. The correct command is `gcloud app deploy`, which is option B. Options A and C are incorrect because `gcloud components` commands are used to install `gcloud` commands for working with parts of App Engine, such as the Python runtime environment. Option D is incorrect; you do not need to specify instance in the command.

5. B. The `app.yaml` file is used to configure an App Engine application, which makes option B correct. The other options are not files used to configure App Engine.

**6.** A. A project can support only one App Engine app, so option A is the right answer. If you'd like to run other applications, they will need to be placed in their own projects.

**7.** C. The correct answer is option C because the correct parameter is `--no-promote`. Option A uses `no-traffic`, which is not a valid parameter to the `gcloud app deploy` command. Option B does not get the code out and could release the code too early if there is a delay in getting the press release out. Option D does not meet the requirements of getting the code out as soon as possible.

**8.** B. App Engine applications are accessible from URLs that consist of the project name followed by `appspot.com`, so option B is correct. Option A is incorrect because the domain is not `appengine.com`. Options C and D are incorrect because the names of services are not used to reference the application as a whole.

**9.** A. `max_concurrent_requests` lets you specify the maximum number of concurrent requests before another instance is started, which makes option A correct. `target_throughput_utilization` functions similarly but uses a 0.05 to 0.95 scale to specify maximum throughput utilization. `max_instances` specifies the maximum number of instances but not the criteria for adding instances. `max_pending_latency` is based on the time a request waits, not the number of requests.

**10.** C. Basic scaling only allows for idle time and maximum instances, so option C is the right answer. `min_instances` is not supported. `target_throughput_utilization` is an autoscaling parameter, not a basic scaling parameter.

**11.** C. The `runtime` parameter specifies the language environment to execute in, which makes option C correct. The script to execute is specified by the `script` parameter. The URL to access the application is based on the project name and the domain `appspot.com`. There is no parameter for specifying the maximum time an application can run.

**12.** A. Resident instances are used with manual scaling while dynamic instances are used with autoscaling and basic scaling, so option A is the correct answer. There are no persistent, stable, or nonresident types of App Engine instances.

**13.** A. Using dynamic instances by specifying autoscaling or basic scaling will automatically adjust the number of instances in use based on load, so option A is correct. Option B is incorrect because autoscaling and basic scaling only create dynamic instances. Options C and D are incorrect because manual scaling will not adjust instances automatically, so you may continue to run more instances than needed at some points.

**14.** A. The correct answer is `gcloud app services set-traffic`. Option B is incorrect because the term `instances` is not needed. Option C is incorrect because it does not specify the term `services`. Option D is incorrect because that would require changes on the client's part.

**15.** A. `--split-traffic` is the parameter used to specify the method for splitting traffic, which makes option A correct. Valid options are `cookie`, `ip`, and `random`. All other options are not valid parameters to the `gcloud app services set-traffic` command.

16. B. `--split` is the parameter for specifying a list of instances and the percent of traffic they should receive, so option B is the right answer. The other options are not valid parameters for the `gcloud app services set-traffic` command.

17. C. `--migrate` is the parameter for specifying that traffic should be moved or migrated to the newer instance, which makes option C the correct answer. The other options are not valid parameters for the `gcloud app services set-traffic` command.

18. D. From the App Engine console you can view the list of services and versions as well as information about the utilization of each instance.

19. D. All three methods listed, IP address, HTTP cookie, and random splitting, are allowed methods for splitting traffic.

20. B. The cookie used for splitting in App Engine is called GOOGAPPUID, which makes option B the correct answer. Options A, C, and D are not valid names.

# Chapter 10: Computing with Cloud Functions

1. C. App Engine is designed to support multiple tightly coupled services comprising an application, making option C the correct answer. This is unlike Cloud Functions, which is designed to support single-purpose functions that operate independently and in response to isolated events in the Google Cloud and complete within a specified period of time. Compute Engine is not a serverless option. Cloud Storage is not a computing product.

2. C. A timeout period that is too low would explain why the smaller files are processed in time but the largest are not, which makes option C the right answer. If only 10 percent of the files are failing, then it is not a syntax error or the wrong runtime selected, as in options A and B. Those errors would affect all files, not just the largest ones. Similarly, if there was a permission problem with the Cloud Storage bucket, it would affect all files.

3. B. Those actions are known as events in Google Cloud terminology; thus, option B is the correct answer. An incident may be a security or performance-related occurrence, but those are unrelated to the expected and standardized actions that constitute events. A trigger is a declaration that a certain function should execute when an event occurs. A log entry is related to applications recording data about significant events. Log entries are helpful for monitoring and compliance, but in themselves are not event-related actions.

4. C. The correct answer is option C because SSL is a secure protocol for remotely accessing servers. It is used, for example, to access instances in Compute Engine. It does not have events that can be triggered using Cloud Functions. The three GCP products listed do generate events that can have triggers associated with them.

5. C. Cloud Functions supports three runtimes: Node.js 6, Node.js 8, and Python. Go and Node.js 5 are not supported runtimes.

6. D. HTTP requests using GET, POST, DELETE, PUT, and OPTIONS can invoke an HTTP trigger in Cloud Functions, so option C is the right answer.

7. D. The correct answer, option D, shows the four events supported in Cloud Storage.

   ```
   google.storage.object.finalize
   google.storage.object.delete
   google.storage.object.archive
   google.storage.object.metadataUpdate
   ```

8. C. There is no option to specify the file type to apply the function to, so option C is correct. You can, however, specify the bucket to which the function is applied. You could only save files or the types you want processed in that bucket, or you could have your function check file type and then execute the rest of the function or not, based on type. All the other options listed are parameters to a Cloud Storage function.

9. D. Cloud Functions can have between 128MB and 2GB of memory allocated, which makes option D the correct answer. The default is 256MB.

10. B. By default Cloud Functions can run for up to 1 minute before timing out, so option B is correct. You can, however, set the `timeout` parameter for a cloud function for periods of up to 9 minutes before timing out.

11. B. Python Cloud Functions is currently in beta. The standard set of `gcloud` commands does not include commands for alpha or beta release features by default. You will need to explicitly install beta features using the `gcloud components install beta` command, so option B is the right answer. Option A will install standard `gcloud` commands. Options C and D are not valid `gcloud` commands.

12. A. The correct trigger in option A is `google.storage.object.finalize`, which occurs after a file is uploaded. Option B is not a valid trigger name. Option C triggers when a file is archived, not uploaded. Option D is triggered when some metadata attribute changes, but not necessarily only after a file uploads.

13. C. The three parameters are `runtime`, `trigger-resource`, and `trigger-event`, as listed in option C. All must be set, so options A and B are incorrect. `file-type` is not a parameter to creating a cloud function on Cloud Storage, so option D is incorrect.

14. A. The correct answer is option A, `gcloud functions delete`. Option B references components, which is incorrect. You do need to reference components when installing or updating `gcloud` commands but not when deleting a cloud function, so options B and C are incorrect. Option D is incorrect because the GCP entity type, in this case `functions`, comes before the name of the operation, in this case `delete`, in a `gcloud` command.

15. B. Messages are stored in a text format, base64, so that binary data can be stored in the message in a text format, so option B is correct. Option A is incorrect; it is needed to map from a binary encoding to a standard text encoding. Option C is incorrect because the function does not pad with extra characters to make them the same length. Option D is incorrect; it does not change dictionary data types into list data types.

16. C. Option C is correct because it includes the name of the function, the runtime environment, and the name of the Pub/Sub topic. Option A is incorrect because it's missing both the runtime and the topic. Option B is incorrect because it is missing the topic. Option D is incorrect because the runtime specification is incorrect; you have to specify `python37` and not `python` as the runtime.

17. B. There is only one type of event that is triggered in Cloud Pub/Sub, and that is when a message is published, which is option B. Option A is incorrect; Cloud Pub/Sub has one event type that can have a trigger. Option C is incorrect; Cloud Pub/Sub does not analyze the code to determine when it should be run. Option D is incorrect; you do not have to specify an event type with Cloud Pub/Sub functions.

18. B. The correct answer is option B because it uses a Cloud Storage finalize event to trigger conversion if needed. There is minimal delay between the time the file is uploaded and when it is converted. Option A is a possibility but would require more coding than option B. Option C is not a good option because files are not converted until the batch job runs. Option D is incorrect because you cannot create a cloud function for Cloud Pub/Sub using a finalize event. That event is for Cloud Storage, not Cloud Pub/Sub.

19. D. All of the options are available along with zip from Cloud Storage.

20. A. The HTTP trigger allows for the use of POST, GET, and PUT calls, so option A is the correct answer. Webhook and Cloud HTTP are not valid trigger types. Option D is incorrect because option A is the correct answer.

# Chapter 11: Planning Storage in the Cloud

1. D. Once a bucket is created as either regional or multiregional, it cannot be changed to the other, so option D is correct. Nearline to coldline and regional to nearline are both allowed, as is multiregional to coldline.

2. C. The goal is to reduce cost, so you would want to use the least costly storage option. Coldline has the lowest per-gigabyte charge at $0.07/GB/month, so option C is correct. Nearline is the next lowest followed by regional. Multiregional has the highest per-gigabyte charge. Both nearline and coldline have access charges, but those are not considered in this question.

3. B. Bigtable is a wide-column database that can ingest large volumes of data consistently, so option B is correct. It also supports low-millisecond latency, making it a good choice for supporting querying. Cloud Spanner is a global relational database that is not suitable for high-speed ingestion of large volumes of data. Datastore is an object data model and not a good fit for IoT or other time series data. BigQuery is an analytics database and not designed for ingestion of large volumes of data in short periods of time.

4. A. Option A is correct because Memorystore is a managed Redis cache. The cache can be used to store the results of queries. Follow-on queries that reference the data stored in the cache can read it from the cache, which is much faster than reading from persistent disks. SSDs have significantly lower latency than hard disk drives and should be used for performance-sensitive applications like databases. Options B and D are incorrect because HDD persistent disks do give the best performance with respect to IOPS. Options C and D are incorrect because Datastore is a managed NoSQL database and would not have any impact on SQL query performance.

5. B. HDDs are the better choice for persistent disks for a local database when performance is not the primary concern and you are trying to keep costs down, so option B is correct. Option A is wrong because SSDs are more expensive and the users do not need the lowest latency available. Options C and D are wrong; both of those are other databases that would not be used to store data in a local relational database.

6. B. Lifecycle configurations can change storage class from regional to nearline or coldline. Once a bucket is created as regional or multiregional, it cannot be changed to the other, so option B is the right answer. Option A is true; you can set retention periods when creating a bucket. Option C is true; Cloud Storage does not provide file system–like access to internal data blocks. Option D is true because Cloud Storage is highly durable.

7. A. The most recent version of an object is called the live version, so option A is correct. Options B and C are incorrect; top and active are not terms used to refer to versions. Option D is incorrect because option A is correct.

8. B. Both Cloud SQL and Spanner are relational databases and are well suited for transaction-processing applications, so option B is right. Option A is incorrect because BigQuery is relational, but it is designed for data warehousing and analytics, not transaction processing. Options C and D are incorrect because Bigtable a wide-column NoSQL database, not a relational database.

9. C. Both MySQL and PostgreSQL are Cloud SQL options so Option C is correct. Options A and B are incorrect, SQL Server is not a Cloud SQL option. Option D is incorrect because Oracle is not a Cloud SQL option. You could choose to run SQL Server or Oracle on your instances but you would have to manage them, unlike Cloud SQL managed databases.

10. D. The multiregional and multi-super-regional location of nam-eur-aisa1 is the most expensive, which makes option D the right answer. Option A is a region that costs less than the multi-super-regional nam-eur-asia1. Option C is incorrect; that is a zone, and Spanner is configured to regions or super regions. Option B is incorrect; it is only a single super region, which cost less than deploying to multiple super regions.

11. D. BigQuery, Datastore, and Firebase are all fully managed services that do not require you to specify configuration information for VMs, which makes option D correct. Cloud SQL and Bigtable require you to specify some configuration information for VMs.

12. B. Datastore is a document database, which makes option B correct. Cloud SQL and Spanner are relational databases. Bigtable is a wide-column database. Google does not offer a managed graph database.

**13.** A. BigQuery is a managed service designed for data warehouses and analytics. It uses standard SQL for querying, which makes option A the right answer. Bigtable can support the volume of data described, but it does not use SQL as a query language. Cloud SQL is not the best option to scale to tens of petabytes. SQL Server is a relational database from Microsoft; it is not a GCP-managed database service.

**14.** B. Firestore is a document database that has mobile supporting features, like data synchronization, so option B is the right answer. BigQuery is for analytics, not mobile or transactional applications. Spanner is a global relational database but does not have mobile-specific features. Bigtable could be used with mobile devices, but it does not have mobile-specific features like synchronization.

**15.** D. In addition to read and write patterns, cost, and consistency, you should consider transaction support and latency, which makes option D correct.

**16.** B. Option B is correct because Memorystore can be configured to use between 1GB and 300GB of memory.

**17.** D. Once a bucket is set to coldline, it cannot be changed to another storage class; thus, option D is correct. Regional and multiregional can change to nearline and coldline. Nearline buckets can change to coldline.

**18.** A. To use BigQuery to store data, you must have a data set to store it, which makes option A the right answer. Buckets are used by Cloud Storage, not BigQuery. You do not manage persistent disks when using BigQuery. An entity is a data structure in Datastore, not BigQuery.

**19.** D. With a second-generation instance, you can configure the MySQL version, connectivity, machine type, automatic backups, failover replicas, database flags, maintenance windows, and labels, so option D is correct.

**20.** A. Access charges are used with nearline and coldline storage, which makes option A correct. There is no transfer charge involved. Options C and D do not refer to actual storage classes.

# Chapter 12: Deploying Storage in Google Cloud Platform

**1.** C. Creating databases is the responsibility of database administrators or other users of Cloud SQL, so option C is correct. Google applies security patches and performs other maintenance, so option A is incorrect. GCP performs regularly scheduled backups, so option B is incorrect. Database administrators need to schedule backups, but GCP makes sure they are performed on schedule. Cloud SQL users can't SSH into a Cloud SQL server, so they can't tune the operating system. That's not a problem; Google takes care of that.

2. A. Cloud SQL is controlled using the `gcloud` command; the sequence of terms in `gcloud` commands is `gcloud` followed by the service, in this case `SQL`; followed by a resource, in this case `backups`, and a command or verb, in this case `create`. Option A is the correct answer. Option B is incorrect because `gsutil` is used to work with Cloud Storage, not Cloud SQL. Option C is wrong because the order of terms is incorrect; `backups` comes before `create`. Option D is incorrect because the command or verb should be `create`.

3. A. Option A is the correct answer. The base command is `gcloud sql instances patch`, which is followed by the instance name and a start time passed to the `--backup-start-time` parameter. Option B is incorrect because `databases` is not the correct resource to reference; `instances` is. Option C uses the `cbt` command, which is for use with Bigtable, so it is incorrect. Similarly, Option D is incorrect because it uses the `bq` command, which is used to manage BigQuery resources.

4. C. Datastore uses a SQL-like query language called GQL, so option C is correct. Option A is incorrect; SQL is not used with this database. Option B is incorrect; MDX is a query language for online analytic processing (OLAP) systems. Option D is incorrect because DataFrames is a data structure used in Spark.

5. C. Option C is the correct command. It has the correct base command, `gcloud datastore export`, followed by the `--namespaces` parameter and the name of a Cloud Storage bucket to hold the export file. Option A is incorrect because the `--namespaces` parameter name is missing. Option B is incorrect because it is missing a namespace. Option D is incorrect because it uses the command or verb `dump` instead of `export`.

6. C. Option C is correct; BigQuery displays an estimate of the amount of data scanned. This is important because BigQuery charges for data scanned in queries. Option A is incorrect; knowing how long it took you to enter a query is not helpful. Option B is incorrect; you need to use the scanned data estimate with the Pricing Calculator to get an estimate cost. Option D is incorrect; you do not create clusters in BigQuery as you do with Bigtable and Dataproc. Network I/O data is not displayed.

7. B. Option B shows the correct `bq` command structure, which includes `location` and the `--dry_run` option. This option calculates an estimate without actually running the query. Options A and C are incorrect because they use the wrong command; `gcloud` and `gsutil` are not used with BigQuery. Option D is also wrong. `cbt` is a tool for working with Bigtable, not BigQuery. Be careful not to confuse the two because their names are similar.

8. A. Option A is correct; the menu option is Job History. Options B and C are incorrect; there is no Active Jobs or My Jobs option. Job History shows active jobs, completed jobs, and jobs that generated errors. Option D is incorrect; you can get job status in the console.

9. C. BigQuery provides an estimate of the amount of data scanned, and the Pricing Calculator gives a cost estimate for scanning that volume of data. Options A, B, and C are incorrect; the Billing service tracks charges incurred. It is not used to estimate future or potential charges.

**10.** B. Option B is correct; the next step is to create a database within the instance. Once a database is created, tables can be created, and data can be loaded into tables. Option A is incorrect; Cloud Spanner is a managed database, so you do not need to apply security patches. Option C is incorrect because you can't create tables without first having created a database. Option D is incorrect; no tables are created that you could import data into when an instance is created.

**11.** D. Option D is correct because there is no need to apply patches to the underlying compute resources when using Cloud Spanner. because Google manages resources used by Cloud Spanner. Updating packages is a good practice when using VMs, for example, with Compute Engine, but it is not necessary with a managed service.

**12.** C. This use case is well suited to Pub/Sub, so option C is correct. It involves sending messages to the topic, and the subscription model is a good fit. Pub/Sub has a retention period to support the three-day retention period. Option A is incorrect; Bigtable is designed for storing large volumes of data. Dataproc is for processing and analyzing data, not passing it between systems. Cloud Spanner is a global relational database. You could design an application to meet this use case, but it would require substantial development and be costly to run.

**13.** C. Pub/Sub works with topics, which receive and hold messages, and subscriptions, which make messages available to consuming applications; therefore, option C is correct. Option A is incorrect; tables are data structures in relational databases, not message queues. Similarly, option B is wrong because databases exist in instances of database management systems, not messaging systems. Option D is wrong because tables are not a resource in messaging systems.

**14.** C. The correct command is `gcloud components install cbt` to install the Bigtable command-line tool, so option C is correct. Options A and B are incorrect; `apt-get` is used to install packages on some Linux systems but is not specific to GCP. Option D is incorrect; there is no such command as `bigtable-tools`.

**15.** A. You would need to use a `cbt` command, which is the command-line tool for working with Bigtable, so option A is correct. All other options reference `gcloud` and are therefore incorrect.

**16.** B. Cloud Dataproc is a managed service for Spark and Hadoop, so option B is correct. Cassandra is a big data distributed database but is not offered as a managed service by Google, so options A and C are incorrect. Option D is incorrect because TensorFlow is a deep learning platform not included in Dataproc.

**17.** B. The correct command is `gcloud dataproc clusters create` followed by the name of the cluster and the a `--zone` parameter. Option B is correct. Option A is incorrect because `bq` is the command-line tool for BigQuery, not Dataproc. Option C is a `gcloud` command missing a verb or command, so it is incorrect. Option D is wrong because option B is the correct answer.

18. B. `gsutil` is the correct command, so option B is correct. Option A is incorrect because `gcloud` commands are not used to manage Cloud Storage. Similarly, options C and D are incorrect because they use commands for Bigtable and BigQuery, respectively.

19. B. The command in option B correctly renames an object from an old name to a new name. Option A is incorrect because it uses a `cp` command instead of `mv`. Option C does not include bucket names, so it is incorrect. Option D uses `gcloud`, but `gsutil` is the command-line tool for working with Cloud Storage.

20. A. Dataproc with Spark and its machine learning library are ideal for this use case, so option A is correct. Option B suggests Hadoop, but it is not a good choice for machine learning applications. Option C is incorrect because Spanner is designed as a global relational database with support for transaction processing systems, not analytic and machine learning systems. Option D is incorrect. SQL is a powerful query language, but it does not support the kinds of machine learning algorithms needed to solve the proposed problem.

# Chapter 13: Loading Data into Storage

1. C. `gsutil` is the command-line utility for working with Cloud Storage. It is one of the few GCP services that does not use `gcloud`. (BigQuery and Bigtable are others.) Option C is the correct answer because `mb`, short for "make bucket," is the verb that follows `gsutil` to create a bucket. Options A and D are wrong because they use `gcloud` instead of `gsutil`. Option B is wrong because it uses `gsutil` with a command syntax used by `gcloud`.

2. B. The correct answer is option B; `gsutil` is the command to copy files to Cloud Storage. Option A is incorrect; the verb is `cp`, not copy. Options C and D are wrong because `gsutil`, not `gcloud`, is the command-line utility for working with Cloud Storage.

3. C. From the console, you can upload both files and folders. Options A and B are incorrect because they are missing an operation that can be performed in the console. Option D is incorrect because there is no `diff` operation in Cloud Console.

4. D. When exporting a database from Cloud SQL, the export file format options are CSV and SQL, which makes option D correct. Option A is incorrect because XML is not an option. Options B and C are incorrect because JSON is not an option.

5. A. Option A, SQL format, exports a database as a series of SQL data definition commands. These commands can be executed in another relational database without having to first create a schema. Option B could be used, but that would require mapping columns to columns in a schema that was created before loading the CSV, and the database administrator would like to avoid that. Options C and D are incorrect because they are not export file format options.

6. C. Option C is the correct command, `gcloud sql export sql`, indicating that the service is Cloud SQL, the operation is export, and the export file format is SQL. The filename and target bucket are correctly formed. Option A is incorrect because it references `gcloud storage`, not `gcloud sql`. Option B is incorrect because it is missing an export file format parameter. Option D is incorrect because the bucket name and filename are in the wrong order.

7. A. Option A uses the correct command, which is `gcloud datastore export` followed by a namespace and a bucket name. Option B is incorrect because the bucket name is missing `gs://`. Options C and D are incorrect because they use the command `dump` instead of `export`. The bucket name in option D is missing `gs://`.

8. C. The export process creates a metadata file with information about the data exported and a folder that has the data itself, so option C is correct. Option A is incorrect because export does not produce a single file; it produces a metadata file and a folder with the data. Option B is incorrect because it does not include the data folder. Option D is incorrect because the correct answer is option C.

9. B. Option B is correct because XML is not an option in BigQuery's export process. All other options are available.

10. D. Option D is correct because YAML is not a file storage format; it used for specifying configuration data. Options A, B, and C are all supported import file types.

11. A. The correct command is `bq load` in option A. The `autodetect` and `source_format` parameters and path to source are correctly specified in all options. Option B is incorrect because it uses the term `import` instead of `load`. Options C and D are incorrect because they use `gcloud` instead of `bq`.

12. B. The correct answer is B because Dataflow is a pipeline service for processing streaming and batch data that implements workflows used by Cloud Spanner. Option A is incorrect; Dataproc is a managed Hadoop and Spark service, which is used for data analysis. Option C is incorrect; Datastore is a NoSQL database. Option D is incorrect because `bq` is used with BigQuery only.

13. A. Bigtable data is exported using a compiled Java program, so option A is correct. Option B is incorrect; there is no `gcloud` Bigtable command. Option C is incorrect; `bq` is not used with Bigtable. Option D is incorrect because it does not export data from Bigtable.

14. C. Exporting from Dataproc exports data about the cluster configuration, which makes option C correct. Option A is incorrect; data in DataFrames is not exported. Option B is incorrect; Spark does not have tables for persistently storing data like relational databases. Option D is incorrect; no data from Hadoop is exported.

15. C. The correct answer is option C; the service Dataproc supports Apache Spark, which has libraries for machine learning. Options A and B are incorrect, neither is an analysis or machine learning service. Option D, DataAnalyze, is not an actual service.

16. A. The correct command in option A uses `gcloud` followed by the service, in this case `pubsub`, followed by the resource, in this case `topics`; and finally the verb, in this case `create`. Option B is incorrect because the last two terms are out of order. Options C and D are incorrect because they do not use `gcloud`. `bq` is the command-line tool for BigQuery. `cbt` is the command-line tool for Bigtable.

17. C. The correct answer, option C, uses `gcloud pubsub subscriptions create` followed by the topic and the name of the subscription. Option A is incorrect because it is missing the term `subscriptions`. Option B is incorrect because it is missing the name of the subscription. Option D is incorrect because it uses `gsutil` instead of `gcloud`.

18. B. Using a message queue between services decouples the services, so if one lags it does not cause other services to lag, which makes option B correct. Option A is incorrect because adding a message queue does not directly mitigate any security risks that might exist in the distributed system, such as overly permissive permissions. Option C is incorrect; adding a queue is not directly related to programming languages. Option D is incorrect; by default, message queues have a retention period.

19. B. The correct answer is B, `gcloud components` followed by `install` and then `beta`. Option A is incorrect because `beta` and `install` are in the wrong order. Options C and D are wrong because `commands` is used instead of `components`.

20. A. The correct parameter name is `autodetect`, which is option A. Options B and C are not actually valid `bq` parameters. Option D is a valid parameter, but it returns the estimated size of data scanned to when executing a query.

21. A. Avro supports Deflate and Snappy compression. CSV supports Gzip and no compression. XML and Thrift are not export file type options.

# Chapter 14: Networking in the Cloud: Virtual Private Clouds and Virtual Private Networks

1. D. Virtual private clouds are global, so option D is correct. By default, they have subnets in all regions. Resources in any region can be accessed through the VPC. Options A, B, and C are all incorrect.

2. B. IP ranges are assigned to subnets, so option B is correct. Each subnet is assigned an IP range for its exclusive use. IP ranges are assigned network structures, not zones and regions. VPCs can have multiple subnets but each subnet has its own address range.

3. B. Option B is correct; dynamic routing is the parameter that specifies whether routes are learned regionally or globally. Option A is incorrect; DNS is a name resolution service and is not involved with routing. Option C is incorrect; there is no static routing policy parameter. Option D is incorrect because global routing is not an actual option.

4. A. The correct answer is `gcloud compute networks create`, which is option A. Option B is incorrect; `networks vpc` is not a correct part of the command. Option C is incorrect because `gsutil` is the command used to work with Cloud Storage. Option D is incorrect because there is no such thing.

5. A. The Flow Log option of the `create vpc` command determines whether logs are sent to Stackdriver, so option A is correct. Option B, Private IP Access, determines whether an external IP address is needed by a VM to use Google services. Option C is incorrect because Stackdriver Logging is the service, not a parameter used when creating a subnet. Option D is incorrect because variable-length subnet masking has to do with CIDR addresses, not logging.

**6.** C. Shared VPCs can be created at the organization or folder level of the resource hierarchy, so option C is correct. Options A and B are incorrect; shared VPCs are not created at the resource or project levels. Option D is incorrect; shared VPCs are not applied at subnets, which are resources in the resource hierarchy.

**7.** A. The correct answer is the Networking tab of the Management, Security, Disks, Networking, Sole Tenancy section of the form, which makes option A correct. The Management tab is not about subnet configurations. Option D is incorrect because it does not lead to Sole Tenancy options.

**8.** A. VPC is used for interproject communications. Option B is incorrect; there is no interproject peering. Options C and D are incorrect; they have to do with linking on-premise networks with networks in GCP.

**9.** B. The target can be all instances in a network, instances with particular network tags, or instances using a specific service account, so option B is correct. Option A is incorrect; action is either allow or deny. Option C is incorrect; priority determines which of all the matching rules is applied. Option D is incorrect; it specifies whether the rule is applied to incoming or outgoing traffic.

**10.** D. Direction specifies whether the rule is applied to incoming or outgoing traffic, which makes option D the right answer. Option A is incorrect; action is either allow or deny. Option B is incorrect; target specifies the set of instances that the rule applies to. Option C is incorrect; priority determines which of all matching rules is applied.

**11.** A. The 0.0.0.0/0 matches all IP addresses, so option A is correct. Option B represents a block of 16,777,214 addresses. Option C represents a block of 1,048,574 addresses. Option D represents a block of 65,534. You can experiment with CIDR block options using a CIDR calculator such as the one at `www.subnet-calculator.com/cidr.php`.

**12.** B. The product you are working with is compute and the resource you are creating is a firewall rule, so option B is correct. Options A and C references network instead of compute. Option D references `rules` instead of `firewall-rules`.

**13.** B. The correct parameter is `network`, which makes option B correct. Option A is incorrect; `subnet` is not a parameter to `gcloud` to create a firewall. Option C is incorrect; `destination` is not a valid parameter. Option D is incorrect; `source-ranges` is for specifying sources of network traffic the rule applies to.

**14.** A. The rule in option A uses the correct `gcloud` command and specifies the `allow` and `direction` parameters. Option B is incorrect because it references `gcloud network` instead of `gcloud compute`. Option C is incorrect because it does not specify the port range. Option D is incorrect because it does not specify the protocol or port range.

**15.** D. Option D is correct because it is the largest number allowed in the range of values for priorities. The larger the number, the lower the priority. Having the lowest priority will ensure that other rules that match will apply.

**16.** C. The VPC create option is available in the Hybrid Connectivity section, so option C is correct. Compute Engine, App Engine, and IAM & Admin do not have features related to VPNs.

17. C. The Google Compute Engine VPN is where you specify information about the Google Cloud end of the VPN connection, so option C is correct. You specify name, description, network, region, and IP address. Option A is incorrect because tunnels are about the connections between the cloud and the remote network. Option B is incorrect; Routing Options is about how to configure routers. Option D is incorrect; IKE Version is about exchanging secret keys.

18. A. Option A is correct because global dynamic routing is used to learn all routes on a network. Option B is incorrect; regional routing would learn only routes in a region. Options C and D are incorrect because they are not used to configure routing options.

19. B. The autonomous system number (ASN) is a number used to identify a cloud router on a network, so option B is correct. IP addresses are not unique identifiers for the BGP protocol. Option C is incorrect; there is no dynamic load routing ID. Option D is incorrect because option B is correct.

20. D. When using `gcloud` to create a VPN, you need to create forwarding rules, tunnels, and gateways, so all the `gcloud` commands listed would be used.

# Chapter 15: Networking in the Cloud: DNS, Load Balancing, and IP Addressing

1. B. The A record is used to map a domain name to an IPv4 address, so option B is correct. Option A is incorrect because the AAAA record is used for IPv6 addresses. Option C is incorrect; NS is a name server record. Option D is incorrect; SOA is a start of authority record.

2. A. DNSSEC is a secure protocol designed to prevent spoofing and cache poisoning, so option A is correct. Options B and C are incorrect because SOA and CNAME records contain data about the DNS record; they are not an additional security measure. Option D is incorrect because deleting a CNAME record does not improve security.

3. A. The TTL parameters specify the time a record can be in a cache before the data should be queried again, so option A is correct. Option B is incorrect; this time period is not related to timeouts. Option C is incorrect; the TTLs are not related to time restriction on data change operations. Option D is not correct; there is no manual review required.

4. B. The correct answer, Option B, is gcloud beta dns managed-zones create. Option A is incorrect, it uses the gsutil command which is used to work with Cloud Storage. Option C is incorrect, it is missing the term dns. Option D is incorrect, the ordering of terms is incorrect.

5. B. The `visibility` parameter is the parameter that can be set to private, so option B is correct. Option A is not a valid parameter. Option C is incorrect; private is not a parameter. Similarly, option D is incorrect; status is not a valid parameter for making a DNS zone private.

6. C. The three global load balancers are HTTP(S), SSL Proxy, and TCP Proxy, so option C is correct. Options A and B are missing at least one global load balancer. Option D is incorrect because Internal TCP/UD is a regional load balancer.

7. D. Network TCP/UDP enables balancing based on IP protocol, address, and port, so option D is correct. Options A, B, and C are all global load balancers, not regional ones.

8. A. In the console there is an option to select between From Internet To My VMs and Only Between My VMs. This is the option to indicate private or public, so option A is correct. Options B, C, and D are all fictitious parameters.

9. B. TCP Proxy load balancers require you to configure both the frontend and backendthe , so option B is correct. Options A and D are incorrect because they are missing one component. Option C is incorrect; forwarding rules are the one component specified with network load balancing. There is no component known as a traffic rule.

10. B. Health checks monitor the health of VMs used with load balancers, so option B is correct. Option A is incorrect, nearline storage is a type of Cloud Storage. Option C and D are incorrect; storage devices or buckets are not health checked.

11. B. You specify ports to forward when configuring the frontend, so option B is correct. The backend is where you configure how traffic is routed to VMs. Option C is incorrect; Network Services is a high-level area of the console. Option D is incorrect; VPCs are not where you specify load balancer configurations.

12. A. The correct answer, option A, `is gcloud compute forwarding-rules create`. Option B is incorrect; the service should be `compute`, not `network`. Option C is incorrect; `create` comes after `forwarding-rules`. Option D is incorrect because it has the wrong service, and the verb is in the wrong position.

13. C. Static addresses are assigned until they are released, so option C is correct. Options A and B are incorrect because internal and external addresses determine whether traffic is routed into and out of the subnet. External addresses can have traffic reach them from the Internet; internal addresses cannot. Option D is incorrect; ephemeral addresses are released when a VM shuts down or is deleted.

14. A. An ephemeral address is sufficient, since resources outside the subnet will not need to reach the VM and you can SSH into the VM from the console, so option A is correct. Option B is incorrect because there is no need to assign a permanent address, which would then have to be released. Option C is incorrect; there is no Permanent type. Option D is incorrect; there is no IPv8 address.

15. D. You cannot reduce the number of addresses using any of the commands, so option D is correct. Option A is incorrect because the prefix length specified in the `expand-ip-range` command must be a number less than the current length. If there are 65,534 addresses, then the prefix length is 16. Option B is incorrect for the same reason, and the prefix length cannot be a negative number. Option C is incorrect; there is no `--size` parameter.

16. B. The prefix length specifies the length in bits of the subnet mask. The remaining bits of the IP address are used for device addresses. Since there are 32 bits in an IP address, you subtract the length of the mask to get the number of bits used to represent the address. 16 is equal to $2^4$, so you need 4 bits to represent 14 addresses. 32-4 is 28, so option B is the correct answer. Option A would leave 1 address, option C would provide 4,094 addresses, and option D would provide 65,534.

17. C. Premium is the network service level that routes all traffic over the Google network, so option C is correct. Option A is incorrect; the Standard tier may use the public Internet when routing traffic. Options B and D are incorrect; there are no service tiers called Google-only or non-Internet.

18. B. Stopping and starting a VM will release ephemeral IP addresses, so option B is correct. Use a static IP address to have the same IP address across reboots. Option A is incorrect; rebooting a VM does not change a DNS record. Option C is incorrect because if you had enough addresses to get an address when you first started the VM and you then released that IP address, there should be at least one IP address assuming no other devices are added to the subnet. Option D is incorrect because no other changes, including changes to the subnet, were made.

19. A. Internal TCP/UDP is a good option. It is a regional load balancer that supports UDP, so option A is correct. Options B, C, and D are all global load balancers. Option B supports TCP, not UDP. Option D supports HTTP and HTTPS, not UDP.

20. B. Network Services is the section of Cloud Console that has the Cloud DNS console, so option B is correct. Option A is incorrect; Compute Engine does not have DNS management forms. Neither does option C, Kubernetes Engine. Option D is related to networking, but the services in Hybrid Connectivity are for services such as VPNs.

# Chapter 16: Deploying Applications with Cloud Launcher and Deployment Manager

1. D. Categories of solutions include all of the categories mentioned, so option D is correct. Others include Kubernetes Apps, API & Services, and Databases.

2. B. The Cloud Launcher is also known as Marketplace, so option B is correct. Option A is incorrect because the Cloud Deployment Manager is used to create deployment templates. Options C and D are fictional names of services.

3. A. You launch a solution by clicking the Launch on Compute Engine link in the overview page, so option A is correct. Option B is incorrect; the main page has summary information about the products. Option C is incorrect; Network Services is unrelated to this topic. Option D is incorrect because option A is the correct answer.

4. B. Cloud Launcher has a set of predefined filters, including filtering by operating system, so option B is correct. Option A may eventually lead to the correct information, but it is not efficient. Option D is incorrect because it is impractical for such a simple task.

5. B. Multiple vendors may offer configurations for the same applications, so option B is correct. This gives users the opportunity to choose the one best suited to their requirements. Options A and C are incorrect; this is a feature of Cloud Launcher. Option D is incorrect because option B is the correct answer.

6. C. Cloud Launcher will display configuration options appropriate for the application you are deploying, so option C is correct. For example, when deploying WordPress, you will have the option of deploying an administration tool for PHP. Option A is incorrect; this is a feature of Cloud Launcher. Option B is incorrect; you are not necessarily on the wrong form. Option D is incorrect; this is a feature of Cloud Launcher.

7. D. You can change the configuration of any of the items listed, so option D is correct. You can also specify firewall rules to allow both HTTP and HTTPS traffic or change the zone in which the VM runs.

8. B. Deployment Manager is the name of the service for creating application resources using a YAML configuration file, so option B is correct. Option A is incorrect, although you could use scripts with `gcloud` commands to deploy resources in Compute Engine. Options C and D are incorrect because those are fictitious names of products.

9. D. Configuration files are defined in YAML syntax, so option D is correct. Options A, B, and C are all incorrect; configuration files are defined in YAML.

10. B. Configuration files define resources and start with the term resources, so option B is correct. Options A, B, and C are all incorrect. Those terms do not start the configuration file.

11. D. All three, `type`, `properties`, and `name`, are used when defining resources in a Cloud Deployment Manager configuration file, so option D is correct.

12. D. All three can be set; specifically, the keys are `deviceName`, `boot`, and `autodelete`. Option D is correct.

13. A. Option A is the correct command. Option B is incorrect; it is missing the term `compute`. Option C is incorrect; `gsutil` is the command for working with Cloud Storage. Option D is incorrect because the terms `list` and `images` are in the wrong order.

14. D. Google recommends using Python for complicated templates, so option D is correct. Option A is incorrect because Jinja2 is recommended only for simple templates. Options B and C are incorrect; neither language is supported for templates.

15. A. The correct answer is `gcloud deployment-manager deployments create`, so option A is correct. Options B and D are incorrect; the service is not called `cloud-launcher` in the command. Option C is incorrect; `launch` is not a valid verb for this command.

16. C. The correct answer is `gcloud deployment-manager deployments describe`, so option C is correct. Options A and D are incorrect; `cloud-launcher` is not the name of the service. Option B is incorrect; `list` displays a brief summary of each deployment. `describe` displays a detailed description.

17. A. You will be able to configure IP addresses, so option A is correct. You cannot configure billing or access controls in Deployment Manager, so options B and C are incorrect. You can configure the machine type, but that is not the More section of Networking.

18. D. The correct answer is option D because free, paid, and BYOL are all license options used in Cloud Launcher.

19. B. The paid license types include payment for the license in your GCP charges, so option B is correct. The free license type does not incur charges. The BYOL license type requires you to work with the software vendor to get and pay for a license. There is no such license type as chargeback, so option D is incorrect.

20. D. LAMP is short for Linux, Apache, MySQL, and PHP. All are included when installing LAMP solutions, so option D is correct.

# Chapter 17: Configuring Access and Security

1. B. IAM stands for Identity and Access Management, so option B is correct. Option A is incorrect; the A does not stand for authorization, although that is related. Option C is incorrect; the A does not stand for auditing, although that is related. Option D is incorrect. IAM also works with groups, not just individuals.

2. A. Members and their roles are listed, so option A is correct. Options B and C are incorrect because they are missing the other main piece of information provided in the listing. Option D is incorrect; permissions are not displayed on that page.

3. B. Primitive roles were created before IAM and provided coarse-grained access controls, so option B is correct. Option A is incorrect; they are used for access control. Option C is incorrect; IAM is the newer form of access control. Option D is incorrect; they do provide access control functionality.

4. B. Roles are used to group permissions that can then be assigned to identities, so option B is correct. Option A is incorrect; roles do not have identities, but identities can be granted roles. Option C is incorrect; roles do not use access control lists. Option D is incorrect; roles do not include audit logs. Logs are collected and managed by Stackdriver Logging.

5. C. The correct answer is `gcloud projects get-iam-policy ace-exam-project`, so option C is correct. Option A is incorrect because the resource should be `projects` and not `iam`. Option B is incorrect; `list` does not provide detailed descriptions. Option D is incorrect because `iam` and `list` are incorrectly referenced.

6. B. New members can be users, indicated by their email addresses, or groups, so option B is correct. Option A is incorrect; it does not include groups. Options C and D are incorrect because roles are not added there.

7. D. Deployers can read application configurations and settings and write new application versions, so option D is correct. Option A is incorrect because it is missing the ability to read configurations and settings. Option B is incorrect because it is missing writing new versions. Option C is incorrect because it references writing new configurations.

8. B. The correct steps are navigating to IAM & Admin, selecting Roles, and then checking the box next to a role, so option B is correct. Option A is incorrect; all roles are not displayed automatically. Option C is incorrect; audit logs do not display permissions. Option D is incorrect; there is no Roles option in Service Accounts.

9. D. Predefined roles help implement both least privilege and separation of duties, so option D is correct. Predefined roles do not implement defense in depth by themselves but could be used with other security controls to implement defense in depth.

10. D. The four launch stages available are alpha, beta, general availability, and disabled, so option D is correct.

11. B. The correct answer, option B, is `gcloud iam roles create`. Option A is incorrect because it references `project` instead of `iam`. Option C is incorrect because it references `project` instead of `iam`, and the terms `create` and `roles` are out of order. Option D is incorrect because the terms `create` and `roles` are out of order.

12. B. Scopes are permissions granted to VM instances, so option B is correct. Scopes in combination with IAM roles assigned to service accounts assigned to the VM instance determine what operations the VM instance can perform. Options A and C are incorrect; scopes do not apply to storage resources. Option D is incorrect; scopes do not apply to subnets.

13. C. Scope identifiers start with `https://www.googleapis.com/auth/` and are followed by a scope-specific name, such as `devstorage.read_only` or `logging.write`, so option C is correct. Option A is incorrect; scope IDs are not randomly generated. Option B is incorrect; the domain name is not `googleserviceaccounts`. Option D is incorrect; scopes are not linked directly to projects.

14. C. Both scopes and IAM roles assigned to service accounts must allow an operation for it to succeed, so option C is correct. Option A is incorrect; access controls do not affect the flow of control in applications unless explicitly coded for that. Option B is incorrect; the most permissive permission is not used. Option D is incorrect; the operation will not succeed.

15. B. The options for setting scopes are: Allow Default Access, Allow Full Access, and Set Access For Each API, so option B is correct. Option A is incorrect; it is missing Set Access For Each API. Option C is incorrect; it is missing Allow Default Access. Option D is incorrect; it is missing Allow Full Access.

16. B. The correct command is `gcloud compute instances set-service-account`, so option B is correct. Option A is incorrect; there is no `set-scopes` command verb. Option C is incorrect; the command verb is not `set-scopes`. Option D is incorrect; there is no command verb `define-scopes`.

17. A. You can assign a service account when creating a VM using the `create` command. Option B is incorrect; there is no `create-service-account` command verb. Option C is incorrect; there is no `define-service-account` command verb. Option D is incorrect; there is no `instances-service-account command`; also, `create` should come at the end of the command.

18. C. Stackdriver Logging collects, stores, and displays log messages, so option C is correct. Option A is incorrect; Compute Engine does not manage logs. Option B is incorrect; Cloud Storage is not used to view logs, although log files can be stored there. Option D is incorrect; custom logging solutions are not GCP services.

19. B. Logs can be filtered by resource, type of logs, log level, and period of time only, so option B is correct. Options A, C, and D are incorrect because they are missing at least one option.

20. B. This is an example of assigning the least privilege required to perform a task, so option B is correct. Option A is incorrect; defense in depth combines multiple security controls. Option C is incorrect because it is having different people perform sensitive tasks. Option D is incorrect; vulnerability scanning is a security measure applied to applications that helps reveal potential vulnerabilities in an application that an attacker could exploit.

# Chapter 18: Monitoring, Logging, and Cost Estimating

1. B. The Monitoring service is used to set a threshold on metrics and generate alerts when a metric exceeds the threshold for a specified period of time, so option B is correct. Option A is incorrect; Logging is for collecting logged events. Option C is incorrect; Cloud Trace is for application tracing. Option D is incorrect; Debug is used to debug applications.

2. B. You must install the monitoring agent on the VM. The agent will collect data and send it to Stackdriver, so option B is correct. Option A is incorrect because a Workspace is not installed on a VM; it is created in Stackdriver. Option C is incorrect; there is no Monitor With Stackdriver check box in the VM configuration form. Option D is incorrect because you set notification channels in Stackdriver, not on a VM.

3. D. Stackdriver can monitor resources in GCP, AWS, and in on-premise data centers, so option D is correct. Options A through C are incorrect because they do not include two other correct options.

4. B. Aligning is the process of separating data points into regular buckets, so option B is correct. Option A is incorrect; aggregation is used to combine data points using a statistic, such as mean. Options C and D are incorrect; they are not processes related to processing streams of metric data.

5. D. All three options are valid notification channels in Stackdriver Monitoring, so option D is correct. PagerDuty and HipChat are popular DevOps tools.

**6.** D. The documentation is useful for documenting the purpose of the policy and for providing guidance for solving the problem, so option D is correct. Option A is incorrect; where a policy is stored is irrelevant to its usefulness. Options B and C alone are partially correct, but option D is a better answer.

**7.** A. Alert fatigue is a state caused by too many alert notifications being sent for events that do not require human intervention, so option A is correct. This creates the risk that eventually DevOps engineers will begin to pay less attention to notifications. Option B is incorrect, although it is conceivable that too many alerts could adversely impact performance, but that is not likely. Option C is a potential problem, too, but that is not alert fatigue. Option D is incorrect because too many true alerts contribute to alert fatigue.

**8.** C. Stackdriver Logging stores log entries for 30 days, so option C is correct.

**9.** B. The best option is to use Stackdriver Logging's export functionality to write log data to a log sink, so option B is correct. Option A is incorrect; there is a way to export data. Options C and D are incorrect because writing a custom script would take more time to develop and maintain than using Logging's export functionality.

**10.** D. All three, Cloud Storage buckets, BigQuery data sets, and Cloud Pub/Sub topics, are available as sinks for logging exports, so option D is correct.

**11.** D. All of the options listed can be used to filter, so option D is correct. Log level is another option as well.

**12.** B. The correct answer, option B, is halted. There is no such standard log level status. Statuses include Critical, Error, Warning, Info, and Debug.

**13.** B. The fastest way to see the details is to expand all levels of structured data in the entry, so option B is correct. Option A would show the details, but it is not the fastest way. Option C is more time-consuming than using the functionality built into Stackdriver Logging. Option D is incorrect; there is no such link.

**14.** C. Cloud Trace is a distributed tracing application that provides details on how long different parts of code run, so option C is correct. Option A is incorrect; monitoring is used to notify DevOps engineers when resources are not functioning as expected. Option B is incorrect; Logging is for collecting, storing, and viewing log data, and although log entries might help diagnose bottlenecks, it is not specifically designed for that. Option D is incorrect; Debug is used to generate snapshots and inject logpoints.

**15.** D. Debug is used to generate snapshots that provide a view of the status of an application at a particular point in its execution, so option D is correct. Option A is incorrect; monitoring is used to notify DevOps engineers when resources are not functioning as expected. Option B is incorrect; Logging is for collecting, storing, and viewing log data. Option C is incorrect because Cloud Trace is a distributed tracing application that provides details on how long different parts of code run.

**16.** B. The Google Cloud Status Dashboard at `https://status.cloud.google.com/` has information on the status of GCP services, so option B is correct. Options A and B might lead to information, but they would take longer. Option C is not a link to a source of information on BigQuery.

**17.** B. Both Compute Engine and Kubernetes Engine will require details about the VMs' configurations, so option B is correct. The other options are incorrect because BigQuery and Cloud Pub/Sub are serverless services.

**18.** C. Query pricing in BigQuery is based on the amount of data scanned, so option C is correct. Option A is incorrect; the amount of data storage is specified in the Storage Pricing section. Option B is incorrect; query pricing is not based on the volume of data returned. Option D is incorrect because this is not related to Cloud Storage. Option D is incorrect because option C is correct.

**19.** B. Some operating systems, like Microsoft Windows Server, require a license, so option B is correct. Google sometimes has arrangements with vendors to collect fees for using proprietary software. Option A is incorrect; there is no fixed rate charge for operating systems. Option C is incorrect; the information is sometimes needed to compute charges. Option D is incorrect because if you Bring Your Own License, there is no additional license charge.

**20.** B. OpenCensus is a library for developing custom metrics that can be used with Stackdriver Logging, so option B is correct. Option A is incorrect; Prometheus is an open source monitoring tool, but it is not used to define custom metrics in Stackdriver Monitoring. Option C is incorrect; Grafana is a visualization tools for Prometheus. Option D is incorrect; Nagios is an open source monitoring and alerting service, but it is not used for defining custom metrics in Stackdriver Logging.

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