Google Cloud Certified

Associate Cloud Engineer

Certification Guide 1

Learn with challenge labs, assessment tests and practice exams
to build innovations and real-life experiences

By

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About the Author

My background is in software development. I spent over 15 years writing code (6 years at Microsoft) but I've done a bunch of other things since then too, such as SDLC/process, CI/CD, security, architecture, PM, leading teams, and so much more.

Lately I've really fallen in love with serverless computing and can simplify the building and running of distributed systems. But I do understand that not every circumstance is best served by a serverless approach and we'll definitely also be looking at some of the traditional approaches in this course.

As far as GCP goes, I've also been certified by Google as both *Associate Cloud Engineer* and *Professional Cloud Architect*. I hold a bunch of AWS certifications too. Now I specialize in cloud computing and machine learning. I have created courses on machine learning, data science and databases.

1. Introduction

This is volume 1 of a 3-volume series, which serve as an exhaustive collection of my guides on Associate Cloud Engineer certification. The series was created from my most recent video courses on Google Cloud. It is awesome and it really could change your life. This I believe is the only most updated series that will get you from wherever you are now to passing Google's Associate Cloud Engineer certification exam.

I included challenge labs, assessment tests and practice exam questions to help you build strong confidence before writing the exam. I also provide support for everyone who bought this book. So if you did, you really have nothing to worry about. If you have questions, or if you need further help in your labs or hands-on projects, just contact me. I personally attend to every inquiry or concern of my readers and get back within 24 hours.

This and other books in the series are regularly updated to ensure you have all you need to both pass your exam and to use the Google cloud in real life, even if you have little or no experience with the Google Cloud. I have already helped a lot of students pass their Associate Cloud Engineer (ACE) and Professional Cloud Architect (PCA) exams with my guides.

My students keep telling me about how learning and getting certified has open so many doors for them. This course could really open doors for you too with the Google cloud because it will help you pass the Google associate cloud engineer exam. I have helped a lot of people already to both the ramp up on GCP (Google Cloud Platform) and to study for their different certification exams.

People want to get certified because it proves that they've learned the skills that companies need to run production workloads in the cloud. So, I have written these guides to help you too do that. This series is the only course you need. I put a lot of hard work into it to teach you how to cloud. So, are you ready to get started? Let’s learn a few things about Google certification exams first.

1.1. How’s Google Certification Exams Different from Amazon's?

Google certification exams tend to dig quite a bit deeper into how the systems work but they're not quite as broad, partly because their cloud itself is not as broad as Amazon’s actually. AWS (Amazon Web Services) seems to make a new service for everything anyone requests and that can sometimes be a good thing. But Google tends to be more deliberate about trying to keep the whole platform really cohesive.

The main thing that people struggle with is that the ACE exam, even more than the others, really tests whether people actually know what's going on in their systems to be able to troubleshoot cloud systems. You need to understand how the data flows around in the system. That's why I put a lot of emphasis in this book on breaking down those data flows, and I've heard people really loved data flow sections in particular.

I think the reason why people find them so impactful is because they're often working so hard to learn lots of stuff that they sometimes forget to step back and look at why and how it all comes together. But that's what really matters in the end: no one really cares whether you know answers to questions on an exam; they care whether you know what to do with real systems in real life. Actually, a lot of people do want to get their PCA and they see that ACE is actually a great stepping stone to get there.

1.2. How Much Overlap Between ACE and PCA?

How much overlap is there between the two? Well ACE has a bit more emphasis on running systems and command line access, while the PCA has more emphasis on business analysis and tradeoffs. But both of them share the same fundamental perspective: first, you need to understand how things work at a pretty deep level and second, you need to have built some things hands on.

That's definitely something we both must agree on. You need to get your hands dirty in order to learn these things properly. Absolutely. That's why I give my students lots of homework to do. That is why I created “challenge labs” where students need to work through some of the problems on their own to get real life experiences. Exactly!

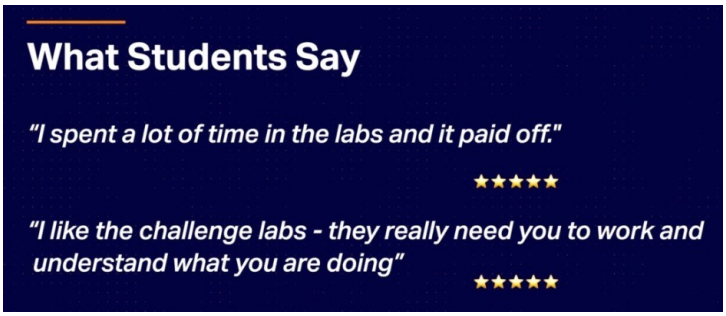

Fig 1.2: My students’ feedback

I get lots of feedback that my students find those labs really helpful because it locks in what they've learned. Actually, I think the biggest reason why so many of my students go on to pass the PCA not long after taking the ACE exam is because of how we go through the material in this book.

I want you to spend almost no time trying to remember stuff. Instead, I want you to succeed because you understand it so well that you can just naturally think through the scenarios that you face.

1.3. What You Will Learn at the End of This Course

Well, you will lean how the Google cloud is set up and its main services, how you can use it through both the web console and the command line, and every other thing you really need to pass Google's associate cloud engineer certification exam and work with their cloud as a cloud engineer.

1.3.1. Objectives of This Course

In this book, I'll answer questions like…

- How do I properly set up my Google Cloud Platform (GCP) account and projects?
- How do I set up and use the various GCP services?
- How can I build a GCP system that I or someone else has already designed?
- How can I get certified by Google as an Associate Cloud Engineer (ACE)?

1.3.2. Course Structure

To accomplish this, we'll start off with a quick look at the target - the certification that Google's defined.

1. Certification/GCP Overview
2. GCP Account Setup (Hands on)
3. GCP Services, including setting them up and getting a feel for them (Hands on)
4. Exam Preparation

Finally, we'll circle back on the certification and make sure you have everything you need to pass that exam and get certified. You will definitely get a lot more out of this course if you follow along and don't just read through. Ideally, you'd use the technique that they often use in medicine, which is, see one, do one, teach one.

For the labs, start off by studying the whole lab through once first. Don't try to follow along the very first time after you've seen how I do it. Then go ahead and try it yourself. Now, it'll be hard to remember everything that you just learned so you should probably go through it again and again as you're doing the steps yourself. After that, if you really want to lock in what you've learned, find someone to tell about it.

1.3.3. Key Takeaways

When you finish this course, you should end up with

- Usable and configured GCP account

- Good solid understanding of how to use all the key GCP services
- What you need to know to get certified as an associate cloud engineer

1.3.4. Prerequisites

Before you dive in, let's talk for a second about prerequisites. The **certification exam itself has no prerequisite**. Google doesn't require you to do anything or prove anything before you're allowed to take this exam. However, if you feel that you want to first learn the fundamentals of cloud computing in general, then check out my other book title:

Cloud Computing Fundamentals: Learn the Latest Cloud Technology and Architecture with Real-World Examples and Applications

You could go and sign up for the exam right now. The cost of the exam is $125 USD. Of course, the reason you're taking this course is because you want to be ready for that exam when you do take it. So, in terms of taking this course, one thing that you should know is that **you'll need a credit card to setup your GCP account**.

If you leave that account as a trial account you won't get charged at all. But Google still requires you to put in a credit card for their own verification. Another thing you'll need is a computer to connect to GCP itself and to the VMs (virtual machines) that we'll be using. Really **any operating system would be just fine**, even a Chromebook. But you'd have trouble if you tried to do everything on just a mobile phone.

What You Should Know about Google Cloud Certification Exams

You have **120 minutes** to complete **50 questions**. Google Cloud recently joined the online exam party. In fact, in April 2020, Google announced that exams for the Associate Cloud Engineer and Professional Cloud Architect certifications would be offered online. This is the first time Google is offering their GCP exams outside of testing centers.

The Google Cloud Certification online exams are currently available in English and Japanese only. All the questions are multiple choice, with 4 or 5 options. Some are multiple response questions, so you need to select all answers correctly to get the points for those questions. If you are provided five check boxes and asked to choose two answers out of five, you must select the two correct answers. There are no ‘true’ and ‘false’ questions.

Considerations

Another thing I should point out is that Google actually has a fairly similar certification system to AWS (Amazon Web Services). In particular, both Google and Amazon certifications require that you have strong mental models of how the platforms work. So, if you're not right now

saying, well of course that's the only way to learn effectively, then you'd probably get a lot of value out of going through that.

Now something to call out though is that you really don't need any AWS experience at all. You also don’t need any previous experience of learning GCP either. Don't worry if you don't know AWS. It could help but it's really not necessary for this course. But speaking of this, let's take a quick look at your (the student’s) background.

1.3.5. Your Background

As I've already said, you don't need any previous experience with GCP or AWS to take this course but there's no question that you may already have such experience. But there's a lot more than just those two things, things like, **Azure**, **Kubernetes**, or just building **distributed systems** in general. You may even have experience with things like **Linux**, the **command line** or programming in general, etc. Those could all have an impact.

Any one of those things would be an asset to you, including the *etc.*, because that is definitely not a full list. However, none of them is required to be able to take this course. You might have no experience with any of them and that's okay. But I wanted to mention them because I think they'll help you better understand how I've designed this course.

1.3.6. My Course Design Principles

In particular there are two key principles that I try to always follow. I really respect your time so I want this course to be **as efficient as possible**. I want you to learn what you need to learn but I don't want you to waste hours and hours on stuff that isn't important.
This was actually one of the critical factors in my decision to use this course.

A few months ago, I was comparing this course to a course I bought from other providers, and I had to ask myself, is it more valuable than those other courses? Are they just going to be wasting my time? It turned out that my course was just really efficient. So, I was really happy with my decision to use my course to create this book.

Now, at the same time, I want this course to be really **accessible**. I want you to be able to follow along with it and learn what you need to learn regardless of your background. Now if I were designing this course for only you by yourself then it would actually be pretty easy to make sure that it is both efficient and accessible. I would figure out where you are at and I would teach you all and only the things that you would need to know.

But given the very wide range of students that I have taking this course, these two things are in a bit of contention. But that's OK too. It just means that you will have to approach this course a little bit differently than if this were a one on one tutoring.

You need to take an active role in making sure that you're learning the things that we're covering. Let me explain. At the start of this course, I'll go into a lot more detail and demonstrate a lot more things. But as we move along, I'll expect you to practice the things you've already learned outside of this course and join up with me for the labs by the end of this course.

You'll be able to do a lot more independently. You'll be able to work through the homework I give you and you'll be able to choose from the hundreds of available code labs to fill in the gaps in your understanding. You'll go through our exams and be shown what *you* are missing. So, you can spend your time studying what matters most to you.

Now if *you* come with a very strong background, for example if you've already been working with all of the things I listed in section 1.3.5, this should make for a very efficient way for you to get ramped up. You may even want to increase your study speed though I don't recommend that you completely skip any of the sections.

But if *you* are at the opposite just-getting-started-end of the spectrum, you will definitely need to work harder at this but it should still be accessible. You will need to go more slowly, maybe read more of the resources from the links I provided, repeat more of what you go through, both this book and labs, and ask more questions. This is fine. This course is also designed to accommodate you.

You may also have a unique background, for example, you may have mastered Microsoft Azure, or you may be someone who has been programming for years but this is the first time you're jumping into the cloud. You could be looking to make a career change entirely. That's why I think this course will also be very effective for you for the different things we cover. I will try to give you a quick primer on the background stuff you need to know but I won't go into so much detail on everything that you'll go crazy if you're already familiar with that.

I will also point you to **additional resources**, including a link to download all the screenshots in this book, for follow up so you can quickly ramp up on whatever the things are that you haven't encountered before. But if I don't remember to do this for something then just use the support link at the bottom of this book to ask. I or any of my colleagues would be very happy to recommend some additional resources. This leads directly into the next thing that I want to mention now as you go through this course.

I highly recommend that after every lesson you should participate in some discussions that are attached to it on our community and forum I mentioned in section 1.3.2. This gives you an opportunity to both ask questions and answer them. You don't even have to be writing something all the time either. You can just read and vote on the other things that other people have been writing.

Now these aren't face to face discussions like you might have with other students in a classroom but these work on your schedule. If you have a few minutes on a break, go ahead and read a few things. It'll really help you learn things if you talk about what you're learning with other people.

You can also connect with me and message me on social media using the links I provided in this book. I have provided many resources so you have something to read on your phone or tablet when you're standing in line at the grocery store or wherever. You should always be able to get to the same link from the resources section for that particular lecture.

Now that everything seems all right, let's start on the path to certification and dive into the Google Cloud Platform. If you have any questions already please let me know. If not please join me in the first lecture below and we'll get started. Dive in!

2. Certification Exam Guide

Welcome to the first lecture! In this lecture, we're going to take a look at the exam guide or blueprint that Google has written to tell us all about their certification exam. Now wait in case you're a person who really only cares about learning GCP and doesn't care about the exam or certification. Just hear me out please.

The purpose of this exam guide is that it's Google's statement of what's most important to a person who wants to pass this certification exam. But it's more than that. This is also Google's statement of what's most important to a person who's working in the field as a cloud engineer.

The Google certification team has gone through a lot of effort to understand what it is that cloud engineers actually do and what they found forms the basis of this certification exam. So, what that means is that **this exam guide defines the scope of the role first and that then became the scope of the exam**.

And because we're using Google's insight of what's most important, this defines the scope of this course as well.

2.1. Google’s Job Role Description

All right. So, let's take a look at the job role description that they've given us. They say…

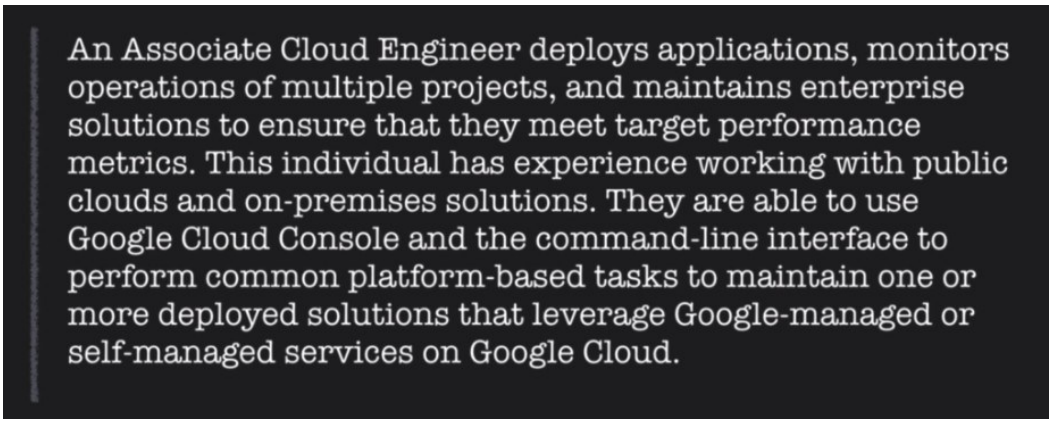

Fig 2.1: Google's job role description

Now this looks a lot like a job posting that you might come across. Of course, it should. Google designs their certifications to match real world roles. But this is a lot of words. So, let's break it down.

2.1.1. Job Role Highlights

They say you, the associate cloud engineer, **deploys applications**. This means you take the source code and make it available by running it so that the end users can actually use the system.

But you don't just put it into production, you also **monitor the operation of multiple projects** going on at the same time.

However, you're not just watching things either, you're also **maintaining things** to ensure that they meet the target performance metrics. If things start failing, you'll definitely try to fix it. But this also talks about if things are getting too slow or what not.

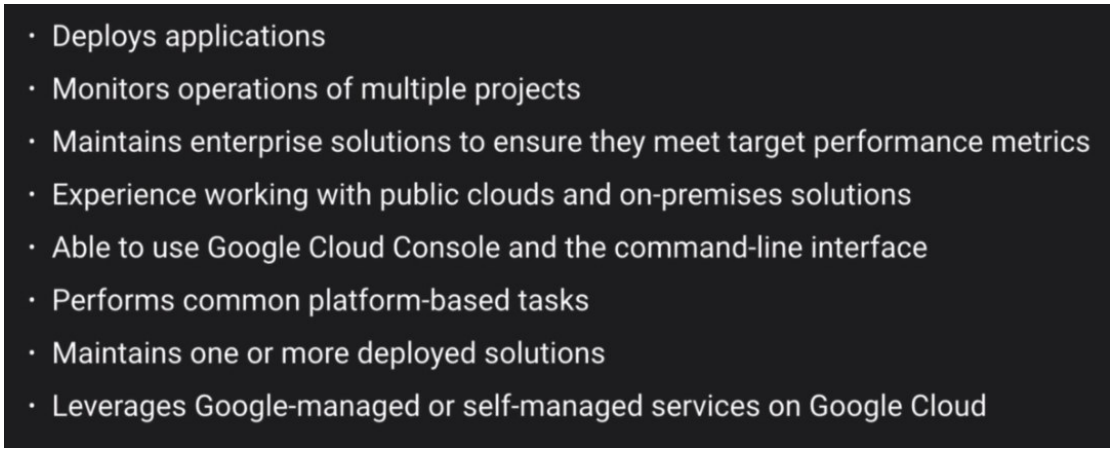

Fig 2.1.1: Job role highlights

You should also have experience working with public cloud and on-premises (usually abbreviated as *on-prem*) solutions. That's an interesting thing to note in a certification that's all about the Google Cloud Platform right now. This could refer to either fully on-prem situations or hybrid ones. But I think the key thing to focus on is that there are a lot of tools that aren't necessarily cloud specific and there are situations that you need to think about more than just the cloud itself.

Continuing on, Google calls out that you do need to be able to use the Google cloud console. But if you don't know how to use the command line interface you don't meet the requirements here. So, I'll include some of both in this course.

They say you need to be able to perform common platform-based tasks. This is fairly general but we'll get into more details later. This is the same thing when they are talking about maintaining one or more deployed solutions but this time, they tie it to leveraging services on the Google cloud.

Now after this introduction section they continue to break the entire exam scope down into sections.

2.2. Overview of the Exam Sections (aka “Domain”)

These are sometimes referred to as **exam domains**. There are 5 of them.

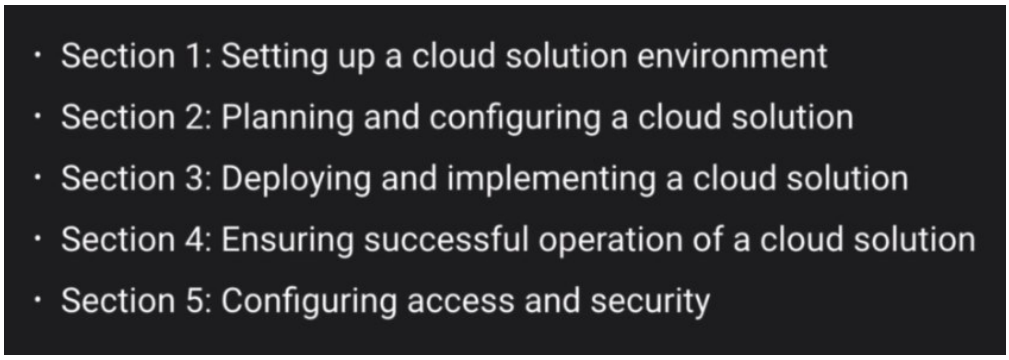

Fig 2.2: The 5 exam domains

Now the exam guide breaks each of these sections down into sub points as listed below, and then further offers example tasks for each of those sub points. In this lecture we're going to take a look at the sub points but not all of the example tasks.

I do highly recommend that you go and read through the entire exam guide yourself. The sooner the better really. But you'll definitely also want to read it several times over as you're approaching your exam.

1. Setting up a cloud solution environment

1.1 Setting up cloud projects and accounts. Activities include:

- Creating projects
- Assigning users to predefined IAM roles within a project
- Managing users in Cloud Identity (manually and automated)
- Enabling APIs within projects
- Provisioning one or more Stackdriver workspaces

1.2 Managing billing configuration. Activities include:

- Creating one or more billing accounts
- Linking projects to a billing account
- Establishing billing budgets and alerts
- Setting up billing exports to estimate daily/monthly charges

1.3 Installing and configuring the command line interface (CLI), specifically the Cloud SDK (e.g., setting the default project).

2. Planning and configuring a cloud solution

2.1 Planning and estimating GCP product using the Pricing Calculator

2.2 Planning and configuring compute resources. Considerations include:

- Selecting appropriate compute choices for a given workload (e.g., Compute Engine, Google Kubernetes Engine, App Engine, Cloud Run, Cloud Functions)
- Using preemptible VMs and custom machine types as appropriate

2.3 Planning and configuring data storage options. Considerations include:

- Product choice (e.g., Cloud SQL, BigQuery, Cloud Spanner, Cloud Bigtable)
- Choosing storage options (e.g., Standard, Nearline, Coldline, Archive)

2.4 Planning and configuring network resources. Tasks include:

- Differentiating load balancing options
- Identifying resource locations in a network for availability
- Configuring Cloud DNS

3. Deploying and implementing a cloud solution

3.1 Deploying and implementing Compute Engine resources. Tasks include:

- Launching a compute instance using Cloud Console and Cloud SDK (gcloud) (e.g., assign disks, availability policy, SSH keys)
- Creating an autoscaled managed instance group using an instance template
- Generating/uploading a custom SSH key for instances
- Configuring a VM for Stackdriver monitoring and logging
- Assessing compute quotas and requesting increases
- Installing the Stackdriver Agent for monitoring and logging

3.2 Deploying and implementing Google Kubernetes Engine resources. Tasks include:

- Deploying a Google Kubernetes Engine cluster
- Deploying a container application to Google Kubernetes Engine using pods
- Configuring Google Kubernetes Engine application monitoring and logging

3.3 Deploying and implementing App Engine, Cloud Run, and Cloud Functions resources. Tasks include, where applicable:

- Deploying an application, updating scaling configuration, versions, and traffic splitting
- Deploying an application that receives Google Cloud events (e.g., Cloud Pub/Sub events, Cloud Storage object change notification events)

3.4 Deploying and implementing data solutions. Tasks include:

- Initializing data systems with products (e.g., Cloud SQL, Cloud Datastore, BigQuery, Cloud Spanner, Cloud Pub/Sub, Cloud Bigtable, Cloud Dataproc, Cloud Dataflow, Cloud Storage)
- Loading data (e.g., command line upload, API transfer, import/export, load data from Cloud Storage, streaming data to Cloud Pub/Sub)

3.5 Deploying and implementing networking resources. Tasks include:

- Creating a VPC with subnets (e.g., custom-mode VPC, shared VPC)
- Launching a Compute Engine instance with custom network configuration (e.g., internal-only IP address, Google private access, static external and private IP address, network tags)
- Creating ingress and egress firewall rules for a VPC (e.g., IP subnets, tags, service accounts)
- Creating a VPN between a Google VPC and an external network using Cloud VPN
- Creating a load balancer to distribute application network traffic to an application (e.g., Global HTTP(S) load balancer, Global SSL Proxy load balancer, Global TCP Proxy load balancer, regional network load balancer, regional internal load balancer)

3.6 Deploying a solution using Cloud Marketplace. Tasks include:

- Browsing Cloud Marketplace catalog and viewing solution details
- Deploying a Cloud Marketplace solution

3.7 Deploying application infrastructure using Cloud Deployment Manager. Tasks include:

- Developing Deployment Manager templates
- Launching a Deployment Manager template

4. Ensuring successful operation of a cloud solution

4.1 Managing Compute Engine resources. Tasks include:

- Managing a single VM instance (e.g., start, stop, edit configuration, or delete an instance)
- SSH/RDP to the instance
- Attaching a GPU to a new instance and installing CUDA libraries

- Viewing current running VM inventory (instance IDs, details)
- Working with snapshots (e.g., create a snapshot from a VM, view snapshots, delete a snapshot)
- Working with images (e.g., create an image from a VM or a snapshot, view images, delete an image)
- Working with instance groups (e.g., set autoscaling parameters, assign instance template, create an instance template, remove instance group)
- Working with management interfaces (e.g., Cloud Console, Cloud Shell, GCloud SDK)

4.2 Managing Google Kubernetes Engine resources. Tasks include:

- Viewing current running cluster inventory (nodes, pods, services)
- Browsing the container image repository and viewing container image details
- Working with node pools (e.g., add, edit, or remove a node pool)
- Working with pods (e.g., add, edit, or remove pods)
- Working with services (e.g., add, edit, or remove a service)
- Working with stateful applications (e.g. persistent volumes, stateful sets)
- Working with management interfaces (e.g., Cloud Console, Cloud Shell, Cloud SDK)

4.3 Managing App Engine and Cloud Run resources. Tasks include:

- Adjusting application traffic splitting parameters
- Setting scaling parameters for autoscaling instances
- Working with management interfaces (e.g., Cloud Console, Cloud Shell, Cloud SDK)

4.4 Managing storage and database solutions. Tasks include:

- Moving objects between Cloud Storage buckets
- Converting Cloud Storage buckets between storage classes
- Setting object life cycle management policies for Cloud Storage buckets
- Executing queries to retrieve data from data instances (e.g., Cloud SQL, BigQuery, Cloud Spanner, Cloud Datastore, Cloud Bigtable)
- Estimating costs of a BigQuery query
- Backing up and restoring data instances (e.g., Cloud SQL, Cloud Datastore)
- Reviewing job status in Cloud Dataproc, Cloud Dataflow, or BigQuery
- Working with management interfaces (e.g., Cloud Console, Cloud Shell, Cloud SDK)

4.5 Managing networking resources. Tasks include:

- Adding a subnet to an existing VPC
- Expanding a subnet to have more IP addresses
- Reserving static external or internal IP addresses

- Working with management interfaces (e.g., Cloud Console, Cloud Shell, Cloud SDK)

4.6 Monitoring and logging. Tasks include:

- Creating Stackdriver alerts based on resource metrics
- Creating Stackdriver custom metrics
- Configuring log sinks to export logs to external systems (e.g., on-premises or BigQuery)
- Viewing and filtering logs in Stackdriver
- Viewing specific log message details in Stackdriver
- Using cloud diagnostics to research an application issue (e.g., viewing Cloud Trace data, using Cloud Debug to view an application point-in-time)
- Viewing Google Cloud Platform status
- Working with management interfaces (e.g., Cloud Console, Cloud Shell, Cloud SDK)

5. Configuring access and security

5.1 Managing identity and access management (IAM). Tasks include:

- Viewing IAM role assignments
- Assigning IAM roles to accounts or Google Groups
- Defining custom IAM roles

5.2 Managing service accounts. Tasks include:

- Managing service accounts with limited privileges
- Assigning a service account to VM instances
- Granting access to a service account in another project

5.3 Viewing audit logs for project and managed services.

Cloud Computing Components

- Compute resources
- Storage
- Networking
- Specialized services

Difference between Cloud Computing and Data Center Computing

- Rent instead of own resources
- Pay-as-you-go-for-what-you-use model
- Elastic resource allocation

- Specialized services