Cloud Computing 1

*This exam is in pilot status. No certificate is available.

Exam Information

Exam number
891

Items
28

Points
30

Prerequisites
Any basic computer science or information technology course

Recommended course length
One semester

National Career Cluster
Information Technology

Performance standards
Included (Optional)

Certificate available
No

Description

The Cloud Computing 1 industry certification exam explores cloud computing services, applications, technologies, and use cases (Case-Based Learning). Learners demonstrate their understanding of cloud computing best practices and how cloud computing aids in developing a global infrastructure and fostering innovative technologies.

Exam Blueprint

Standard	Percentage of exam
1. Cloud structures & features	17%
2. Storing & sharing content in the cloud	30%
3. Securing & monitoring in the cloud	27%
4. Data management	10%
5. Managing & optimizing cloud features	17%
6. Skills for career development (Optional)	

Standard 1

Cloud Structure and Features: Students define cloud computing and its impacts and benefits and compares the major services offered by cloud computing providers.

Objective 1 Global Infrastructure: Students will review the basics of cloud computing. Including the impacts and benefits of computing in the cloud. The student will be introduced to services offered by cloud computing providers.

1. Define cloud computing as the on-demand delivery of IT resources via the internet with pay-as-you-go pricing and its impacts
2. Benefits of cloud computing vs. on-premise computing
   a. Pay less to start up, pay more as business grows
   b. Computing power and storage scales fit current needs
   c. The role of virtualization in cloud computing
   d. Adding new resources is fast and easy
   e. Cloud providers maintain, secure, and run the computers and facilities for cloud services
   f. Ease of use, flexibility
3. Introduction to types of cloud computing
   a. IaaS
   b. PaaS
   c. SaaS
4. History of cloud computing

Objective 2 Structures of the Cloud: Students will dive deep into the three different types of cloud services, the geographical layout of cloud services through regions, availability zones, and edge locations.

1. Recognize and compare the types of cloud computing
   a. IaaS (Infrastructure as a Service)
   b. PaaS (Platform as a Service)
   c. SaaS (Software as a Service)
2. Explain the purpose of regions, availability zones, and edge locations
   a. Regions
      i. 20 public and 5 non-public
   b. Availability zones
      i. Independent data centers
   c. Edge locations
      i. Nearest point to the consumer

Standard 1 Performance Evaluation included below (Optional)

Standard 2

Storing and Sharing Content in the Cloud: Students demonstrate how to store and share content in the cloud.

Objective 1   Cloud Computing Services/Consoles: Students will be introduced to common features and functions of commonly used cloud services. They will access and navigate commonly used services in cloud computing consoles.

1. Data storage services
   a. S3
   b. EBS
2. Database systems
   a. RDS
   b. Redshift
   c. DynamoDB
3. Cloud monitoring services
   a. CloudTrail
   b. CloudWatch

Objective 2   Virtual Servers: Students will understand an EC2 instance and how to use it to host a website and the purpose of access keys, domain name systems, and virtual private clouds.

1. Explain how a S3 bucket and EC2 instance interact to allow for website hosting
2. Types of websites
   a. Static – A website that does not change based on user interactions
   b. Dynamic – A website that changes based on user interactions
3. Functions of a domain name system (DNS)
4. Implement reservations to ensure instances keep assigned IP addresses
5. Understand a virtual private cloud and its uses

Objective 3   Content Delivery: Students will learn about content delivery networks and understand why it is important to have one.

1. Benefits and uses of a content delivery network, such as CloudFront
2. Understand edge locations

Objective 4   Virtual Storage: Identify the different types of cloud data storage and the benefits of each. (Ex: Object Storage, File Storage, and Block Storage). Students will understand Elastic Block Storage (EBS) and compare it to S3. Storage tiers will be introduced.

1. EBS volume types:
   a. General Purpose SSD
   b. Provisioned IOPS SSD
   c. Throughput Optimized HDD
   d. Cold HDD
2. Categories of volume types
   a. SSD
   b. HDD
3. Benefits and features of EBS

a. Data Availability
    b. Date Persistence
    c. Data Encryption
    d. Snapshots

Standard 2 Performance Evaluation included below (Optional)

Standard 3

Securing and Monitoring in the Cloud: Apply cloud security best practices in relation to identity and access management (IAM), including best practices, roles, users, policies, and security groups.

Objective 1 Security I: Students will get an overview of cloud security in relation to Identity and Access Management (IAM). They will understand basic information on best practices, roles/users/policies, and security groups.
1. Understand identity and access management (IAM) and its best practices.
    a. Lock away your account root user access keys
    b. Create individual IAM users
    c. Use groups to assign permissions to IAM users
    d. Grant least privilege
    e. Review IAM permissions
    f. Configure a strong password policy for your users
    g. Enable multi-factor authentication (MFA)
    h. Use roles to delegate permissions
    i. Do not share access keys
    j. Rotate credentials regularly
    k. Remove unnecessary credentials
    l. Use policy conditions for extra security
    m. Monitor activity in your account
2. Analyze the cultural and societal impacts of cloud security
3. Differentiate among a role, user, groups, and policy in cloud security
    a. Role: An IAM identity that you can create in your account that has specific permissions.
    b. User: An entity that you create to represent the person or application that uses it to interact with.
    c. Group: A collection of IAM users, allowing you to specify permissions for multiple users.
    d. Policy: An object that, when associated with an identity or resource, defines its permissions.
4. Use a process to resolve vulnerabilities in a web server

Objective 2 Security II: Students will analyze the cultural and societal impacts of cloud security and be able to determine whether security best practices are being followed.
1. Understand the areas of security that must be addressed for cloud computing:
    a. Data

b. Privileges
        c. Infrastructure
        d. Assessment
    2. Understand the difference between infrastructure and assessment
        a. Attacks on infrastructure and network access
    3. Recognize types of attacks and prevention techniques
        a. DDoS
        b. AWS Web Application Firewall, AWS Inspector, etc. for prevention
    4. Understand the process to resolve vulnerabilities in a web server
    5. Understand how security can impact society, determine best practiced, and make recommendations to fix security lapses

Objective 3   Monitoring the Cloud: Students will explore the tools used to keep track of activities in the cloud and their relation to costs. Monitoring, logging, and reporting will be reviewed.
    1. A monitoring and observability service that provides data and insights to monitor applications (for example: Amazon CloudWatch)
    2. A service that logs, continuously monitors, and retains account activity related to actions across infrastructure (for example: Amazon CloudTrail)
    3. A service that monitors and records resource configurations (for example: AWS Config)
    4. A managed messaging service for system-to-system and app-to-person communication (for example: Amazon SNS)

Standard 3 Performance Evaluation included below (Optional)

Standard 4
Data Management: Students will understand the differences in databases and when to use them, the benefits of caching data, and how to build a virtual cloud (VPC).

Objective 1   Elastic Load Balancers and Databases: Students will learn about Relational Database Service (RDS) and data warehousing.
    1. Database Warehousing
    2. Database and Database Systems
        a. Types of Relational Database Systems (for example: Amazon Aurora, Amazon RDS)
        b. Types of Non-Relational Database Systems (for example: DynamoDB)
    3. Processing
        a. Online transactional processing
        b. Online analytical processing

Objective 2   Databases: Students will learn the purpose of elasticache services and benefits of caching data.
    1. Understand Elastic Load Balancing: performance, features, and benefits.
    2. Data Caching Services (for example: AWS Elasticache)
        a. Explain the benefits of caching data, some could include:

        i.   Improved performance

       ii.   Reduced costs

     iii.   Predictable performance

     iv.   Lower latency

Objective 3   Elastic Beanstalk and Cloud Formation: Students will understand the purpose of Elastic Beanstalk and Cloud Formation.

1. Elastic Beanstalk (EBS) – its uses and benefits.
2. Understand the benefits of elasticity including:
   a. Automating best practices
   b. Scaling infrastructure
   c. Manage multiple resources including third party and private resources

Standard 4 Performance Evaluation included below (Optional)

Standard 5

Managing and Optimizing Cloud Features: Students describe the landscape of emerging technologies in the cloud.

Objective 1   Emerging Technologies in the Cloud: Students will research emerging technologies in the cloud with a focus on machine learning and its impacts on society, business, and technology.

1. Supervised Machine Learning starts with training data that includes the desired output to adjust the machine learning algorithm. There are two categories:
   a. Classification – examine an input and choose a response among specific preset choices
   b. Regression – trained to assign value to input
2. Unsupervised Machine Learning
3. Semi Supervised Machine Learning starts with training data that does not include the desired output, and can examine input and group related items together into groups called clusters
4. Reinforcement Machine Learning uses a model to provide positive feedback (reward) the desired behavior and discovers errors
5. The impacts of machine learning on society, business, and technology
6. Examine the range of emerging technologies in society and in the cloud computing environment

Objective 2 Billing and Support: Students will assess value propositions of using cloud technology using calculator tools.

1. Understand the tiered support services and prices of a cloud calculating service, including:
   a. Free tier – no cost, used for learning, and provides no technical support
   b. Developer tier - next level up (ex: $29/month), used for experimenting, technical email support

      c. Business tier – next level up (ex: $100/month), used for production, email, chat and phone support

      d. Enterprise tier – highest level (ex: $15,000/month), used for mission critical workloads, email, chat, phone, support, and a dedicated technical account manager

2. Identify cloud services that can analyze and protect data and manage networks
3. Understand the benefits of public cloud deployment for a startup company (ex: no upfront capital, east of understanding, etc.)

Objective 3   Key Cloud Features: Students will explore services related to protecting data and managing networks. Blockchains will also be explored.

1. A serverless, interactive query service to query data and analyze big data using standard SQL (for example: Amazon Athena)
2. A fully managed data security and privacy service (for example: Amazon Macie)
3. Blockchains – what are they, how are they used, and its benefits.
      a. Blockchain is a way to manage an open distributed ledger or transactions
      b. Blockchain is a growing list of records

Objective 4   Optimizing the Cloud with Kits

1. Explain the infrastructure of cloud development kits or services
2. Explain the benefits and constructs

Standard 5 Performance Evaluation included below (Optional)

Standard 6 (Optional)
Skills for Career Development

Objective 1   Students will demonstrate positive workplace behaviors that enhance employability and job advancement such as regular attendance, promptness, attention to proper attire, maintenance of a clean and safe work environment, appropriate voice, and pride in work.

Objective 2   Students will demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, and willingness to learn new knowledge and skills.

Objective 3   Students will employ effective reading and writing skills; solve problems and think critically; and demonstrate leadership skills and function effectively as a team member.

Workplace Skills

1. Communication
2. Problem Solving
3. Teamwork
4. Critical Thinking
5. Dependability
6. Accountability
7. Legal requirements/expectation

Standard 6 Performance Evaluation included below (Optional)

Cloud Computing 1

Performance assessments may be completed and evaluated at any time during the course. The following performance skills are to be used in connection with the associated standards and exam. To pass the performance standard the student must attain a performance standard average of 8 or higher on the rating scale. Students may be encouraged to repeat the objectives until they average 8 or higher.

Student's Name: _____

Class: _____

Performance standards rating scale

Standard 1 – Cloud Structure and Features   Score:
- Students will be able to generate a cloud service usage plan for a business case study; describing how each of the services could be used to improve the business.
- Students will be able to explain the purpose of a region, availability zone, and edge locations.

Standard 2 – Storing and Sharing Content in the Cloud   Score:
- Students will configure web content distributed via edge locations and attach it to a website.
- Students will create a block storage volume and attach it to a virtual computing instance that hosts a simple website.

Standard 3 – Securing and Monitoring in the Cloud   Score:
- Students will determine whether security best practices are being followed and recommend steps to fix any security lapses.
- Students will be able to compare monitoring services and identify the best cloud security for any given scenario.
- Students will write a compliance program for an organization.

Standard 4 – Data Management   Score:
- Students will create an application using a Platform as a Service (PaaS).
- Students will use a template Infrastructure as code (IaC) tool to build a virtual private cloud (VPC).

Standard 5 – Managing and Optimizing Cloud Features   Score:
- Students will use a software development framework to model and provision a cloud application.

Standard 6 – Skills for Career Development   Score:
- Students will demonstrate positive workplace behaviors that enhance employability and job advancement such as regular attendance, promptness, attention to proper attire, maintenance of a clean and safe work environment, appropriate voice, and pride in work.
- Students will demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, and willingness to learn new knowledge and skills.
- Students will employ effective reading and writing skills; solve problems and think critically; and demonstrate leadership skills and function effectively as a team member.

Performance standard average score:

Evaluator Name: _____

Evaluator Title: _____

Evaluator Signature: _____

Date: _____