

**THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND
TRAINING**



OCCUPATIONAL STANDARDS

OCCUPATION: MOBILE APPLICATION DEVELOPMENT TECHNICIAN

LEVEL: NTA LEVEL 5

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ABBREVIATIONS

APP	Application
CDN	Content Delivery Network
CBET	Competency Based Education and Training
GCC	GNU Compiler Collection
HTTP	Hypertext Transfer Protocol
JDK	Java Development Kit
JSON	JavaScript Object Notation
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training
URL	Uniform Resource Locator
UI	User Interface

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks – essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.

Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.
Standards:	A set of statements, which if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance standards, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, and consists of two or more definite steps that leads to a product, service, or decision.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status, with a high level of human development. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training (NACTVET) has begun the job of drafting Occupational Standards (OS) that will eventually be adopted as National Occupational Standards (NOS) for use in the delivery of TET that meets the needs of the labour market and the country's economic agenda.

Occupational Standards (OS) are performance criteria that are matched with labour market demands. Each of them describes the functions, performance standards, and understanding or knowledge underpinning a given occupation. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruitment, supervision, and appraisal, as well as TET Standards. They are also helpful for benchmarking and harmonizing job qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in application across all public and private institutions.

However, it must be noted that Occupational Standards are different from Training /Education Standards. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical circuits, performs troubleshooting in electrical circuits, etc.), and are usually defined by Employers following procedures as agreed upon by all the stakeholders. On the other hand, Training and Education Standards are developed from the activities defined in the occupational standards, and they specify learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him/her to function at an agreed level in an occupation. Training and Education Standards are used to define curricula in training institutions. It is critical, however, to establish a direct link between the occupational standards and the training standards for both of them to respond collaboratively to the demands of the labour market.

For the purpose of TET delivery, Tanzania has adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programmes. Therefore, it is quite pertinent for TET institutions to use the relevant occupational standards as a benchmark for formulating their curricula.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training.

The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The process of developing these Occupational Standards involved both local and international expertise. The process began with an examination of major documents that guide Tanzanian skills development including the *10-year National Skills Development Strategy (2016-2026)*. NACTVET labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a team of experts in consultation with practitioners developed draft occupational standards. The draft document was used to develop an occupational profile for each occupation (DACUM Chart), which is attached as an **Appendix** to every Occupational Standard.

The occupational standards were validated during the stakeholders' forum held on 22nd and 23rd February 2024 at Morogoro. The information from the stakeholders' forum provides insight from the workplace, professional bodies, regulatory bodies and sector ministries regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR MOBILE APPLICATION DEVELOPMENT TECHNICIANS

The standards cover a broad range of duties and tasks that can be performed by a Mobile Application Development Technician. However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Mobile Application Development Technician may perform tasks in a number of key areas of the Occupational Standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Mobile Application Development Technicians shall complete the mobile APP development, mobile Web development and mobile application testing under the supervision of engineers. They can also complete the basic works of setting up mobile application development environments, designing and creating mobile application interfaces, writing basic function codes of mobile applications, maintaining program codes and testing mobile application software. Generally, the Mobile Application Development Technician performs the following responsibilities:

- a) Mobile application interface development
- b) Webpage design
- c) Coding and environment maintenance
- d) Database installation and simple usage
- e) Operating system configuration and usage

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 4, 5 and 6.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1. OCCUPATIONAL STANDARDS FOR MOBILE APPLICATION DEVELOPMENT TECHNICIAN - NTA LEVEL 5

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATIO N CODE	
DUTY TITLE	DEVELOP MOBILE APPLICATION INTERFACE	DUTY NO.	501
TASK TITLE	SET UP AND CONFIGURE ANDROID APPLICATION DEVELOPMENT ENVIRONMENT	TASK NO.	5011
PERFORMAN CE CRITERIA	The person performing this task must be able to configure and maintain Android development environment in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Operating systems, such as Windows, Mac and Linux; 3. Mobile terminals or emulators; 4. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Prepare the mobile application development device;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Install and configure Android Studio;	

2. Download and install the dependent components of the development tool; 3. Obtain the development tool installation package that matches with the operating system; 4. Download and configure SDK and the development tool (e.g. Java, JDK, JRE); 5. Test and verify the development environment; 6. Update the development tool software version; 7. Create and configure the emulator's system version and screen size, and turn on and off the emulator; 8. Verify and use the mobile application emulation environment; 9. Observe health, occupational and environmental safety rules and regulations.	1.2 Create and configure emulators. 1.3 Configure mobile device as testing device. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Operating principles of the Dalvik virtual machine on the Android platform. 3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Android architecture; 3.2 Relation between Android system and SDK version. 4.0 Essential Skills 4.1 Communication skills; 4.2 Management skills; 4.3 Customer service skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Android application development environment is configured in accordance with user requirements and operation specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational health and safety; 2. Maintenance operation strategies and procedures.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DEVELOP MOBILE APPLICATION INTERFACE	DUTY NO.	501
TASK TITLE	DEBUG MOBILE APPLICATION	TASK NO.	5012
PERFORMAN CE CRITERIA	The person performing this task must be able to debug mobile applications in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Operating systems, such as Windows, Mac and Linux; 3. Mobile terminals or emulators; 4. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Check the structural integrity of an Android application; 2. Check whether the location and naming of image resources are normative; 3. Check the integrity of the theme, style, colour and string resources; 4. Check whether the use of layout resources is normative;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Check the program structure; 1.2 Analyse and solve the application faults. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Specifications for software code security maintenance; 2.2 Data backup principles.	

5. Debug the verification codes, use the command line tool logcat to analyse the logs, and troubleshoot the application; 6. Observe health, occupational and environmental safety rules and regulations.	3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Main structure of an Android application; 3.2 Paths and document formats of Android application resources; 3.3 Functions of various resources in the application. 4.0 Essential Skills 4.1 Communication skills; 4.2 Fault analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Applications are debugged and run successfully in accordance with user requirements and operation specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational health and safety; 2. Maintenance operation strategies and procedures; 3. Definition of the scope of liability.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DEVELOP MOBILE APPLICATION INTERFACE	DUTY NO.	501
TASK TITLE	DESIGN PROGRAM INTERFACE LAYOUT	TASK NO.	5013
PERFORMAN CE CRITERIA	The person performing this task must be able to design mobile application interface in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Operating systems, such as Windows, Mac and Linux; 3. Mobile terminals or emulators; 4. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Open the development environment; 2. Create an Android application following the wizard; 3. Configure the application name, package name and project location; 4. Use the menu to create an XML layout document;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Set up a mobile application interface; 1.2 Use common controls. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Specifications for human-machine interfaces; 2.2 Principles of code writing and maintenance.	

5. Use layout properties to adjust the page; 6. Use codes to add controls; 7. Use control properties to adjust the control location, size, colour and spacing; 8. Write click event codes of interface controls; 9. Run and debug the page; 10. Observe health, occupational and environmental safety rules and regulations.	3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Composition of views; 3.2 Methods to write interface layouts; 3.3 Features of common interface layouts, such as relative layout, linear layout, table layout, frame layout and constraint; 3.4 Generic properties of layouts; 3.5 Features and properties of simple controls; 3.6 Common, single-select and multiple-select Alert Dialog box code structures and differences; 3.7 ListView, CardView, and RecyclerView control differences and properties; 3.8 Adapter functions (such as Anay Adapter). 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Interface layout is designed and maintained in accordance with technical requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Maintenance operation strategies and procedures; 2. Definition of the scope of liability.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DESIGN WEBPAGE	DUTY NO.	502
TASK TITLE	DEVELOP WEBPAGE	TASK NO.	5021
PERFORMANCE CRITERIA	The person performing this task must be able to develop the webpage interfaces in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Use commonly-used HTML tags to develop simple webpages; 2. Compile image and text mixed typesetting pages; 3. Arrange page layouts; 4. Adjust and control the styles of hyperlinks in pages; 5. Create form controls with corresponding functions; 6. Select basic languages and built-in functions to implement data interaction;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Design page contents; 1.2 Implement interactive pages. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Specifications for program writing formats; 2.2 Specifications for human-machine interfaces. 3.0 Theories	

7. Use JavaScript objects and DOM programming to implement interactive pages; 8. Observe health, occupational and environmental safety rules and regulations.	The person performing this task must be able to explain the following theories: 3.1 Underpinning knowledge related to basic elements in HTML; 3.2 Commonly-used webpage layout methods; 3.3 JavaScript programming methods. 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Teamwork skills; 4.4 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	WEB pages that meet technical requirements of the project are created in accordance with user requirements and operation specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Occupational health and safety; 2. Maintenance operation strategies and procedures; 3. Definition of the scope of liability.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	DESIGN WEBPAGE	DUTY NO.	502
TASK TITLE	BEAUTIFY WEBPAGE	TASK NO.	5022
PERFORMAN CE CRITERIA	The person performing this task must be able to beautify webpages in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Various virtual machine environments; 4. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Use CSS style rules to modify the text appearance, and beautify the form interface through controlling the form style; 2. Use CSS3 features, animation effects, multi-column layouts and flexible layouts to beautify webpages; 3. Use the new semantic elements, page enhancement elements and properties, as well as multimedia elements of HTML5 to beautify webpages;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Use CSS styles and new features to beautify webpages. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Specifications for program writing formats; 2.2 Specifications for human-machine interfaces (Dashboards).	

4. Observe health, occupational and environmental safety rules and regulations.	3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Underpinning knowledge of the syntax, properties and parameters of elements in CSS; 3.2 Underpinning knowledge of the webpage layouts and style design in CSS; 3.3 New functions of HTML5. 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Webpages are beautified and maintained in accordance with user requirements and operation specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Maintenance operation strategies and procedures; 2. Definition of the scope of liability.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MAINTAIN CODING AND ENVIRONMENT	DUTY NO.	503
TASK TITLE	SET UP JAVA DEVELOPMENT ENVIRONMENT	TASK NO.	5031
PERFORMANCE CRITERIA	The person performing this task must be able to set-up Java development environment in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians or mobile application development engineers. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Various virtual machine environments; 4. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Download JDK and install it locally; 2. Download and install JRE 3. Download and install Eclipse software; 4. Download and install IntelliJ IDEA software; 5. Download and install Android Studio;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Install JDK and configure environment variables; 1.2 Install and configure Eclipse and IntelliJ IDEA software. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Specifications for formats of the system's environment variables;	

6. Configure PATH in the computer system's environment variables; 7. Write a Java program in Notepad; 8. Compile and run this document; 9. Use a tool to run the Java program; 10. Observe health, occupational and environmental safety rules and regulations.	2.2 Java program naming principles. 3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Functions of JDK; 3.2 Functions of environment variables; 3.3 Java runtime environment; 3.4 Differences between Eclipse and IntelliJ IDEA environments. 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	JDK program is installed in a computer in accordance with user requirements and operation specifications, with PATH configured and development software installed.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Definition of the scope of liability; 2. Occupational health and safety.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	MAINTAIN CODING AND ENVIRONMENT	DUTY NO.	503
TASK TITLE	PERFORM OBJECT-ORIENTED JAVA PROGRAMMING	TASK NO.	5032
PERFORMANCE CRITERIA	The person performing this task must be able to do object-oriented Java programming in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of mobile application development technicians. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Various virtual machine environments; 4. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Write programs that embody three features of being object-oriented; 2. Handle exceptional programs; 3. Write programs of Array and ArrayList classes; 4. Perform Java collection and network multithreading operations;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Write object-oriented and exception handling programs; 1.2 Write core class library, multithreading and reflection programs. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Object-oriented programming syntax rules;	

5. Use operation documents and byte/character streams to read and write documents; 6. Do network programming; 7. Create connections and exchange data; 8. Add, delete, modify and check the database; 9. Write reflection programs; 10. Observe health, occupational and environmental safety rules and regulations.	2.2 File class usage rules; 2.3 JDBC principles; 2.4 Network data exchange principles. 3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Programming ideas; 3.2 Exception handling methods; 3.3 Java core class library use methods; 3.4 Multithreading class usage; 3.5 File class document reading; 3.6 Differences between TCP and UDP; 3.7 JDBC interface calling methods and precautions; 3.8 Reflection use methods. 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Object-oriented Java programming is achieved in accordance with user requirements and operation specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Definition of the scope of liability; 2. Occupational health and safety.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	INSTALL AND USE SIMPLE DATABASE	DUTY NO.	504
TASK TITLE	INSTALL AND DEBUG DATABASE	TASK NO.	5041
PERFORMANCE CRITERIA	The person performing this task must be able to install and debug database software in accordance with technical standards and data application requirements.		
RANGE STATEMENT	The task can be performed in the data centre under the supervision of senior technicians or mobile application development engineers. The tools and equipment to be used include: 1. Device hardware testing tools; 2. USB flash drive's boot disk; 3. Mirror image documents for commonly-used computer operating systems; 4. Virtual machine software installation package; 5. Database software installation package; 6. Mobile application development tool software; 7. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate database software; 2. Obtain the device hardware and software parameters; 3. Select an appropriate version of the database software;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Install and debug a database. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 High performance principle for database selection;	

4. Obtain a specific version of the database software installation package; 5. Install the database software; 6. Complete the initialization and debugging of the database software; 7. Ensure normal operation of the database; 8. Observe health, occupational and environmental safety rules and regulations.	2.2 Reliability principle for database selection; 2.3 Security principle for database selection; 2.4 Manageability principle for database selection. 3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Configurations of device hardware parameters; 3.2 Features of database software and respective applied environment; 3.3 Installation of database software under different system platforms; 3.4 Initialization and debugging of database software under different system platforms. . 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Database development environments are set up, with the databases installed and debugged, in accordance with technical requirements and service specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Secure operations of server devices; 2. Secure operations of network devices; 3. Definition of the scope of liability; 4. Occupational health and safety.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATI ON CODE	
DUTY TITLE	INSTALL AND USE SIMPLE DATABASE	DUTY NO.	504
TASK TITLE	USE DATABASE	TASK NO.	5042
PERFORMANCE CRITERIA	The person performing this task must be able to analyse and complete the database's top architecture design, code implementation, test running and maintenance backup in accordance with project requirements.		
RANGE STATEMENT	The task can be performed in the data centre under the supervision of senior technicians or mobile application development engineers. The tools and equipment to be used include: 1. Device hardware testing tools; 2. USB flash drive's boot disk; 3. Mirror image documents for commonly-used computer operating systems; 4. Virtual machine software installation package; 5. Database software installation package; 6. Mobile application development tool software; 7. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Determine the database's functional requirements; 2. Complete the project requirement analysis report; 3. Create database users and set their permissions; 4. Design and implement the database; 5. Input data;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Use a database. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Database design principles; 2.2 Three paradigms of data table structure design.	

6. Carry out pressure tests; 7. Back up data; 8. Compile the database user manual and maintenance manual; 9. Observe health, occupational and environmental safety rules and regulations.	3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Basic database operation methods; 3.2 Basic operating points of views; 3.3 Basic methods of stored procedures; 3.4 Database transaction handling; 3.5 Precautions for database integrity. 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Database implementation codes that meet the project requirements are written in accordance with user requirements and operation specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Definition of the scope of liability; 2. Occupational health and safety.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CONFIGURE AND USE THE OPERATING SYSTEM	DUTY NO.	505
TASK TITLE	INSTALL THE OPERATING SYSTEM	TASK NO.	5051
PERFORMANCE CRITERIA	The person performing this task must be able to install the operating system and complete basic configurations in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Various virtual machine environments; 4. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Download the applicable virtual machine and operating system; 2. Set up the VMware virtual machine platform; 3. Install CentOS operating system; 4. Configure basic parameters and network parameters of the operating system; 5. Use SFTP remote document management tool;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Set up a virtual machine platform; 1.2 Install and run an operating system. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 The operating system installation specifications; 2.2 System parameter configuration rationalization principles.	

6. Observe health, occupational and environmental safety rules and regulations.	3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Definitions and application of virtual machines and operating systems; 3.2 Generic development environment setup and basic parameter settings. 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The operating system is installed, with basic configurations completed, in accordance with service requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Definition of the scope of user's liability.

OCCUPATION	MOBILE APPLICATION DEVELOPMENT TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CONFIGURE AND USE THE OPERATING SYSTEM	DUTY NO.	505
TASK TITLE	USE THE OPERATING SYSTEM	TASK NO.	5052
PERFORMANCE CRITERIA	The person performing this task must be able to use the operating system to do normal operations in accordance with technical requirements and service specifications.		
RANGE STATEMENT	The task can be performed in the experimental computer room or place with the mobile application development environment under the supervision of senior mobile application development technicians. The tools and equipment to be used include: 1. Computers; 2. Commonly-used computer operating systems; 3. Various virtual machine environments; 4. Safety gear.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Perform basic operating system operations; 2. Use commonly-used commands and development tools of the operating system; 3. Switch among three work modes of Vi editor; 4. Debug the codes by referring to GCC compilation process;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Log in to a user account; 1.2 Interpret the OS directory structure; 1.3 Use a command interpreter and a compilation tool. 2.0 Principles	

5. Master user and user group management commands; 6. Write and debug Shell scripts; 7. Master document management operation commands; 8. Observe health, occupational and environmental safety rules and regulations.	The person performing this task must be able to explain the following principles: 2.1 Principles for the secure use of the operating system (normative use by root users); 2.2 Principles for the stable optimization of the system (debugging). 3.0 Theories The person performing this task must be able to explain the following theories: 3.1 Commonly-used operating system commands and development tools; 3.2 User and user group management commands; 3.3 Methods to write and debug Shell scripts; 3.4 Layout structure of OS documentation system; 3.5 Operating System document I/O operations. 4.0 Essential Skills 4.1 Communication skills; 4.2 Requirement analysis skills; 4.3 Report writing skills; 4.4 Teamwork skills; 4.5 Management skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The operating system is executed to perform normal operations in accordance with service requirements and service provider's specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Definition of the scope of user's liability.

**APPENDIX: DACUM CHARTS FOR MOBILE APPLICATION DEVELOPMENT
TECHNICIAN - NTA LEVEL 5**

DUTIES	TASKS	ENABLERS
1.0 Develop mobile application interface	1.1 Setup and configure Android application development environment	General skills and knowledge • Software development package downloading and installation • Common installation error handling • Emulator and physical device start-up/shutdown • Program installation, running and debugging • Identification, reproduction and simple handling of problems • Mastery and correct use of commonly-used adb commands • Project creation and running • Implementation of the basic display function of static layouts • Modification of layout property parameters to fit the screen size • Implementation of the interactive display in pages Tools and equipment • Mobile devices or emulators • Computers • Commonly-used computer operating systems • Various virtual machine environments • Hard disks Materials
	1.2 Debug mobile application.	
	1.3 Design program interface layout.	

DUTIES	TASKS	ENABLERS
		• Data cables and power adapters • Android studio software Requirements for employees • Care for software, tools and devices • Operating computer devices in a coordinating and proficient way • Behaving in strict accordance with operation specifications and procedures
2.0 Design Webpage	2.1 Develop Webpage.	General skills and knowledge • Design of page contents • Correct selection of data types and setting of variables • Implementation of data interaction by using basic languages (such as operations) and built-in functions • Implementation of interactive pages by using JavaScript objects and DOM programming correctly • Webpage beautification by using layouts
	2.2 Beautify Webpage.	

DUTIES	TASKS	ENABLERS
		• Webpage beautification by using functions such as multimedia elements Tools and equipment • Computers • Mobile devices or emulators • Commonly-used computer operating systems • Various virtual machine environments • Hard disks Materials • Installation packages of Web front-end development tool software: Vscode, etc. Requirements for employees • Teamwork spirit • Integrity • Time management • Intensive study • Emphasis on commitment
3.0 Maintain coding and environment	3.1 Set up Java development environment.	General skills and knowledge • Java installation package downloading and installation • Environment and JDK setup and configuration • Use of common IDEs to create projects • Mastery of naming specifications • Correct compilation and running of Java programs
	3.2 Perform object-oriented Java programming.	

DUTIES	TASKS	ENABLERS
		• Basic syntax of Java • Execution processes of Java programs • Java syntax rules • Object-oriented programming ideas • Three features of being object-oriented • Exception handling and usage • Java core class library usage • Java collection and network multithreading operations • Use of File class operation documents and byte/character streams to read and write documents • TCP/UDP connection creation and data exchange in Java network programming • Use of common APIs of JDBC • Basic concept of reflection • Basic application of reflection Tools and equipment • Computers • Mobile devices or emulators • Commonly-used computer operating systems • Various virtual machine environments • Hard disks Materials • Eclipse/idea/WebStorm, vs and other development tool installation packages • MySQL and sqlserver database installation packages and driver packages

DUTIES	TASKS	ENABLERS
		Requirements for employees • Comprehension • Problem-solving ability • Naming specifications • Normative writing ability • Problem analysis, logical reasoning and judging abilities • Ability to work as a team with clear division of labour and sincere cooperation
4.0 Install and use simple database	4.1 Install and debug database.	General skills and knowledge • Database software installation and testing • Database user classification and permission management • Basic concepts of databases • Database creation, query and deletion • Basic concepts of data tables • Data table addition, deletion, query and modification • Index and primary key creation and deletion in data tables • Basic concepts of views • Implementation view creation, replacement, modification and deletion • Basic concepts of stored procedures; • Creation, execution, display and deletion of the implementation stored procedures • Database transaction isolation level and locking mechanism • Database integrity constraints, integrity checking and breach handling
	4.2 Use database.	

DUTIES	TASKS	ENABLERS
		Tools and equipment • Computers • Mobile devices or emulators • Commonly-used computer operating systems • Various virtual machine environments • Hard disks Materials • Mirror image documents for Windows and Linux operating systems • VMware WorkStation and VirtualBox virtual machine software installation packages • MySQL and sqlserver database installation packages and driver packages • Development tools and related framework dependence Requirements for employees • Teamwork spirit • Integrity • Time management
5.0 Configure and use operating system	5.1 Install operating system.	General skills and knowledge • Virtual machines and operating systems downloading and installation • OS development environment setup and basic parameter setting methods
	5.2 Use operating system.	

DUTIES	TASKS	ENABLERS
		• OS network configuration, familiarity with network management and communication commands • Methods to access Operating System through remote terminals • Proficiency in SFTP remote document management tools • Commonly-used document processing commands • Commonly-used permission management commands • Use of zipping/unzipping commands • Related concepts of users and user groups in OS • User and user group management commands • Methods to switch users in the operating system • Three work modes of editors • Mode switching methods of vi editors • Basic parameter settings of vi editors • Definition and reference methods of Shell variables • Operational methods of Shell variables • Conditional statements in Shell • Statements and loops in Shell • Construction and use methods of Shell functions • Debugging methods of Shell scripts • Proficiency in redirections, pipelines and command connectors

DUTIES	TASKS	ENABLERS
		Tools and equipment • Mobile devices or emulators • Commonly-used computer operating systems • Various virtual machine environments • Hard disks • Mobile devices or emulators • Commonly-used computer operating systems • Various virtual machine environments • Hard disks • Computers Materials • Virtual machine software • Mirror image documents in CDs Requirements for employees • Comprehension • Punctuality • Patience • Attention to details • Teamwork skills