

COMPETENCY-BASED OCCUPATIONAL FRAMEWORK FOR REGISTERED APPRENTICESHIP

Developer

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ABOUT THE URBAN INSTITUTE

The nonprofit Urban Institute is dedicated to elevating the debate on social and economic policy. For nearly five decades, Urban scholars have conducted research and offered evidence-based solutions that improve lives and strengthen communities across a rapidly urbanizing world. Their objective research helps expand opportunities for all, reduce hardship among the most vulnerable, and strengthen the effectiveness of the public sector.

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Competency-Based Occupational Frameworks

The Urban Institute, under contract by the U.S. Department of Labor, has worked with employers, subject matter experts, labor unions, trade associations, credentialing organizations and academics to develop Competency-Based Occupational Frameworks (CBOF) for Registered Apprenticeship programs. These frameworks defined the **purpose** of an occupation, the **job functions** that are carried out to fulfill that purpose, the **competencies** that enable the apprentice to execute those job functions well, and the **performance criteria** that define the specific knowledge, skills and personal attributes associated with high performance in the workplace. This organizational hierarchy – Job Purpose – Job Functions – Competencies – Performance Criteria – is designed to illustrate that performing work well requires more than just acquiring discrete knowledge elements or developing a series of manual skills. To perform a job well, the employee must be able to assimilate knowledge and skills learned in various settings, recall and apply that information to the present situation, and carry out work activities using sound professional judgement, demonstrating an appropriate attitude or disposition, and achieving a level of speed and accuracy necessary to meet the employer’s business need.

The table below compares the terminology of Functional Analysis with that of traditional Occupational Task Analysis to illustrate the important similarities and differences. While both identify the key technical elements of an occupation, Functional Analysis includes the identification of behaviors, attributes and characteristics of workers necessary to meet an employer’s expectations.

Framework Terminology	Traditional Task Analysis Terminology
Job Function- the work activities that are carried out to fulfill the job purpose	Job Duties- roles and responsibilities associated with an occupation
Competency- the actions an individual takes and the attitudes he/she displays to complete those activities	Task- a unit of work or set of activities needed to produce some result
Performance Criteria- the specific knowledge, skills, dispositions, attributes, speed and accuracy associated with meeting the employer’s expectations	Sub Task- the independent actions taken to perform a unit of work or activity

Although designed for use in competency-based apprenticeship, these Competency-Based Occupational Frameworks also support time-based apprenticeship by defining more clearly and precisely what an apprentice is expected to learn and do during the allocated time-period.

CBOFs are comprehensive to encompass the full range of jobs that may be performed by individuals in the same occupation. As employers or sponsors develop their individual apprenticeship programs, they can extract from or add to the framework to meet their unique organizational needs.

Components of the Competency-Based Occupational Framework

Occupational Overview: This section of the framework provides a description of the occupation including its purpose, the setting in which the job is performed and unique features of the occupation.

Work Process Schedule: This section includes the job functions and competencies that would likely be included in an apprenticeship sponsor's application for registration. These frameworks provide a point of reference that has already been vetted by industry leaders so sponsors can develop new programs knowing that they will meet or exceed the consensus expectations of peers. Sponsors maintain the ability to customize their programs to meet their unique needs, but omission of a significant number of job functions or competencies should raise questions about whether or not the program has correctly identified the occupation of interest.

Cross-cutting Competencies: These competencies are common among all workers, and focus on the underlying knowledge, attitudes, personal attributes and interpersonal skills that are important regardless of the occupation. That said, while these competencies are important to all occupations, the relative importance of some versus others may change from one occupation to the next. These relative differences are illustrated in this part of the CBOF and can be used to design pre-apprenticeship programs or design effective screening tools when recruiting apprentices to the program.

Detailed Job Function Analysis: This portion of the framework includes considerable detail and is designed to support curriculum designers and trainers in developing and administering the program. There is considerable detail in this section, which may be confusing to those seeking a more succinct, higher-level view of the program. For this reason, we recommend that the Work Process Schedule be the focus of program planning activities, leaving the detailed job function analysis sections to instructional designers as they engage in their development work.

- a. **Related Technical Instruction:** Under each job function appears a list of foundational knowledge, skills, tools and technologies that would likely be taught in the classroom to enable the apprentice's on-the-job training safety and success.
- b. **Performance Criteria:** Under each competency, we provide recommended performance criteria that could be used to differentiate between minimally, moderately and highly competent apprentices. These performance criteria are generally skills-based rather than knowledge-based, but may also include dispositional and behavioral competencies.

Using the Competency-Based Occupational Framework to Develop a Registered Apprenticeship Program

When developing a registered apprenticeship program, the Work Process Schedule included in this CBOF provides an overview of the job functions and competencies an expert peer group deemed to be important to this occupation. The Work Process Schedule in this document can be used directly, or modified and used to describe your program content and design as part of your registration application.

When designing the curriculum to support the apprenticeship program – including on the job training and related technical instruction – the more detailed information in Section 5 could be helpful. These more detailed job function documents include recommendations for the key knowledge and skill elements that might be included in the classroom instruction designed to support a given job function, and the performance criteria provided under each competency could be helpful to trainers and mentors in evaluating apprentice performance and insuring inter-rater reliability when multiple mentors are involved.

Developer Occupational Overview

Occupational Purpose and Context

Entry level developers perform a wide variety of job functions that apply relevant theories, methods, tools, and interpersonal skills to design, build, operate, monitor, and control a software program or series of software programs or systems. Apprentices should have some existing knowledge of computer basics and pose the ability to learn and apply tools specific to an organization's unique requirements. Developers contribute to a diverse set of products depending on the architecture and industry needs defined by each organization. Developers utilize their creativity and critical thinking abilities to solve unique problems as they arise, and to serve as a vital support to an organization's evolving needs.

Potential Job Titles

Developer, Application/ "App" Developer, Software Application Developer, Mobile Application Developer, Software Programmer, Web Developer, Front end developer, Full Stack Developer.

Attitudes and Behaviors

Developers have a high attention to detail and have well developed critical thinking skills to monitor and detect a wide range of environments, products, programs and systems. They understand and welcome the need to be flexible, and they are excited to learn new programs and applications as systems, projects, and priorities evolve. They are effective communicators, resilient and are dedicated to being a team player. They are eager to assist with all phases of the software development life cycle; and they should strive to be dependable resources throughout all aspects of the project cycle. Additionally, depending on the nature of the work, they are also adept in secure software development practices, referring to the NIST standards, to ensure that protection and security are built into the application or platform from conception.

Apprenticeship Prerequisites

Some apprenticeship programs may require apprentices to have prior knowledge of a programming language, development framework or an operating system; or a combination of such. It is important to understand the differences in these types of languages and when to use which. You should refer to your company's existing platforms and systems to learn what languages, frameworks, and operating systems that will be applicable to your work. Some successful applicants that wish to begin in this field would also have a portfolio of prior relevant work. Some apprenticeships require this while some may not.

Occupational Pathways

Developers may work in an entry level position for 1-5 years, a junior-mid level position for another 1-7 years, and ultimately may work toward becoming a senior level Developer or Software Engineer/ Principal Developer. Alternatively, similar pathways may lead to focused junior, mid-level, and senior positions that hone in on specific program or application development, resulting in a Subject Matter Expert aligned with such application. In addition to this, the Developer apprentice may ultimately map into Information Technology project administration and, ultimately Software Project Management. An alternative pathway for a Developer apprentice to map to, would be the Cybersecurity Support Technician apprenticeship program - or another Secure-Software Development position that has critical cybersecurity-focused components.

Certifications, Licensure and Other Credential Requirements

CREDENTIAL	Offered By	Before, During or After Apprenticeship
N/A		

Job Functions

JOB FUNCTIONS	Core or Optional
1. Participate in and support the creation of product, platform, and/or software development life cycles by assisting Principal Developer and team with initial determination of applicable specifications, requirements, systems and concepts to produce the desired output	Core
2. Support the Principal Developer and team with mapping out requirement specifications, communicate with other key team members	Core
3. Participate in and support designing software or platform with the appropriate team	Core
4. Support the development and assembly of the software, platform, or product	Core
5. Support testing and debugging; participate in integration and deployment	Core

Stackable Programs

This occupational framework is designed to link to the following additional framework(s) as part of a career laddering pathway.

STACKABLE PROGRAMS	Base or Higher Level	Stacks on top of
1. Cybersecurity Support Technician	Higher	Developer; For those interested in secure-software development.

Options and Specializations

The following options and specializations have been identified for this occupation. The Work Process Schedule and individual job function outlines indicate which job functions and competencies were deemed by industry advisors to be optional. Work Process Schedules for Specializations are included at the end of this document.

Options and Specializations	Option	Specialization
Web Developer	X	
Application Developer	X	
Software Developer	X	

Levels

Industry advisors have indicated that individuals in this occupation may function at different levels, based on the nature of their work, the amount of time spent in an apprenticeship, the level of skills or knowledge mastery, the degree of independence in performing the job or supervisory/management responsibilities. These levels may differ by worksite and can be seen as a path for career advancement depending on the occupation and specialization.

Level	Distinguishing Features	Added Competencies	Added Time Requirements
1	Junior Level Developer		
2	Mid-Level Developer		
3	Principal Developer		

Work Process Schedule

WORK PROCESS SCHEDULE		ONET Code: 15-1133.00	
Developer		RAPIDS Code: 1129CB	
JOB TITLE: Developer			
LEVEL: 1		SPECIALIZATION: N/A	
STACKABLE PROGRAM <input type="checkbox"/> yes <input type="checkbox"/> no			
Company Contact: Name			
Address:		Phone	Email
Apprenticeship Type: <input type="checkbox"/> Competency-Based <input type="checkbox"/> Time-Based <input type="checkbox"/> Hybrid		Prerequisites	
JOB FUNCTION 1: Participates in and supports the creation of product, platform, and/or software development life cycles by assisting Principal Developer and team with initial determination of applicable specifications, requirements, systems and concepts to produce the desired output			
Competencies	Core or Optional	RTI	OJT
A. Participates in the implementation of development life cycles and specifications, including supporting of mapping out work plans, under supervision	Core		
B. Supports the creation of tools and languages needed per output in the work plan, under supervision	Core		
C. Participates in supporting Principal Developer to establish overall project goals with senior and other key team members primarily, as well as any external project members, as applicable	Optional		
D. Supports project team members with team consultations that determine end product's feasibility in economic, operational, and technical areas	Core		
E. Assists with offering and applying technical and	Optional		

cost-effective approaches for mitigating risks at the end result, under direction from Principal Developer; and communicates any potential questions or concerns based on preliminary assessments			
JOB FUNCTION 2: Supports the Principal Developer and team with mapping out requirement specifications, communicates with other key team members			
Competencies	Core or Optional	OJT	RTI
A. Coordinates with the Project Manager to communicate desired requirements and objectives clearly to other team members such as the UX team, QA testers, etc.	Core		
B. Ensures proper use of desired Software Requirement Specification (SRS), and clearly defines and documents the product requirements, under supervision	Core		
C. Supports the team/ QA testers in preliminary quality assurance requirements assessments & potential risk assessments, under supervision	Core		
JOB FUNCTION 3: Participates in and supports designing software or platform with the appropriate team			
Competencies	Core or Optional	OJT	RTI
A. Supports the UX team, or appropriate team members, with software design and structure of the software as it relates to implementation, its data models, interfaces between system components, and if applicable, the algorithms used, under supervision	Core		
B. Participates in the identification and development of the best prototype suited for the project, if any; supports identification of appropriate languages, operating systems, and monitoring methods applicable for the final program	Optional		
JOB FUNCTION 4: Supports the development and assembly of the software, platform, or product			
Competencies	Core or Optional	OJT	RTI
A. Applies best practices to the company-specific source code management processes	Core		

B. Continues to support identifying program and project changes or newfound needs as the software or system is formed, apply such project changes or needs effectively under direction from Principal Developer or applicable team members	Core		
C. Participates in building the program using the appropriate languages and/or applicable development methods	Core		
JOB FUNCTION 5: Supports testing and debugging; participates in integration and deployment			
Competencies	Core or Optional	OJT	RTI
A. Participates in recognizing concepts to determine CI/CD configuration, supports building and applying CI/ CD integrations for manual and/or automated functionalities	Core		
B. Supports application of prototyping methods, if applicable	Core		
C. Supports close monitoring to identify issues and reports them in a clear and concise way to senior team members	Core		
D. After issue is reported, clearly tracks and works with team to fix, and re-test until quality standards are met	Core		
E. Makes extensive, detailed notes when any changes are made and/or to clarify why a function must remain the same in a clear way for other team members	Core		
F. Participates in curating implementation preparation documents and plans	Optional		
G. Supports integration and test phase, properly notes progress relevant to project success	Core		
H. Participates in ongoing monitoring of platform, software, or application under project requirements, and supports with providing maintenance, troubleshooting assistance, and applies problem solving capabilities as applicable, under supervision	Core		

Related Technical Instruction Plan

COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	
COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	

Cross-Cutting Competencies

COMPETENCY**		0	1	2	3	4	5	6	7	8
Personal Effectiveness	Interpersonal Skills	0	1	2	3	4	5	6	7	8
	Integrity	0	1	2	3	4	5	6	7	8
	Professionalism	0	1	2	3	4	5	6	7	8
	Initiative	0	1	2	3	4	5	6	7	8
	Dependability and Reliability	0	1	2	3	4	5	6	7	8
	Adaptability and Flexibility	0	1	2	3	4	5	6	7	8
	Lifelong Learning	0	1	2	3	4	5	6	7	8
Academic	Reading	0	1	2	3	4	5	6	7	8
	Writing	0	1	2	3	4	5	6	7	8
	Mathematics	0	1	2	3	4	5	6	7	8
	Science & Technology	0	1	2	3	4	5	6	7	8
	Communication	0	1	2	3	4	5	6	7	8
	Critical and Analytical Thinking	0	1	2	3	4	5	6	7	8
	Basic Computer Skills	0	1	2	3	4	5	6	7	8
Workplace	Teamwork	0	1	2	3	4	5	6	7	8
	Customer Focus	0	1	2	3	4	5	6	7	8
	Planning and Organization	0	1	2	3	4	5	6	7	8
	Creative Thinking	0	1	2	3	4	5	6	7	8
	Problem Solving & Decision Making	0	1	2	3	4	5	6	7	8
	Working with Tools & Technology	0	1	2	3	4	5	6	7	8
	Checking, Examining & Recording	0	1	2	3	4	5	6	7	8
	Business Fundamentals	0	1	2	3	4	5	6	7	8
	Sustainable	0	1	2	3	4	5	6	7	8
	Health & Safety	0	1	2	3	4	5	6	7	8

**Cross-cutting competencies are defined in the Competency Model Clearinghouse:

<https://www.careeronestop.org/CompetencyModel/competency-models/building-blocks-model.aspx>

Cross-Cutting Competencies identify transferable skills – sometimes called “soft skills” or “employability skills” – that are important for workplace success, regardless of a person’s occupation. Still, the relative importance of specific cross-cutting competencies differs from occupation to occupation. The Cross-Cutting Competencies table, above, provides information about which of these competencies is most important to be successful in a particular occupation. This information can be useful to employers or intermediaries in screening and selecting candidates for apprenticeship programs, or to pre-apprenticeship providers that seek to prepare individuals for successful entry into an apprenticeship program.

The names of the cross-cutting competencies come from the U.S. Department of Labor’s Competency Model Clearinghouse and definitions for each can be viewed at

<https://www.careeronestop.org/CompetencyModel/competency-models/building-blocks-model.aspx>

The scoring system utilized to evaluate the level of competency required in each cross cutting skill aligns with the recommendations of the Lumina Foundation’s Connecting Credentials Framework. The framework can be found at: <http://connectingcredentials.org/wp-content/uploads/2015/05/ConnectingCredentials-4-29-30.pdf>

Detailed Job Functions

JOB FUNCTION 1: Participates in and supports the creation of product, platform, and/or software development life cycles by assisting Principal Developer and team with initial determination of applicable specifications, requirements, systems, and concepts to produce the desired output

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Development life cycles • Risk mitigation principles • Programming languages • Application of software tools 	<ul style="list-style-type: none"> • Goal setting/developing work plans • Communication • Logic and the ability to think critically about tradeoffs 	<ul style="list-style-type: none"> • Software to support coding and product development

Competency A: Participates in the implementation of development life cycles and specifications, including supporting of mapping out work plans, under supervision	Core or Optional
PERFORMANCE CRITERIA	
1. Contributes to the selection of a life cycle process model	Core
2. Installs and uses the appropriate tools for a project's designated life cycle model	Core
3. Conducts process activities in a life cycle process model script	Core
4. Contributes to the development of a project's work plan	Core

Competency B: Supports the creation of tools and languages needed per output in the work plan, under supervision	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies the appropriate tools and programming languages necessary to carry out a work plan	Core
2. Contributes to the development of the tools and programming languages needed to execute a work plan	Core
Competency C: Participates in supporting Principal Developer to establish overall project goals with senior and other key team members primarily, as well as any external project members, as applicable	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies both long-term goals of a project and the intermediate goals needed to achieve those goals	Optional
2. Communicates effectively with all team members and external stakeholders	Core
3. Works collaboratively with senior and other key team members as well as appropriate external stakeholders	Core
Competency D: Supports project team members with team consultations that determine end product's feasibility in economic, operational, and technical areas	Core or Optional
PERFORMANCE CRITERIA	
1. Uses cost-benefit analysis to determine the economic feasibility of a product	Core
2. Determines the operation feasibility of a product by considering the tools, skills, and processes needed to maintain its application	Core
3. Identifies the potential limitations of the technologies involved in a project and determines viable alternatives	Core

Competency E: Assists with offering and applying technical and cost-effective approaches for mitigating risks at the end result, under direction from Principal Developer; and communicates any potential questions or concerns based on preliminary assessments	Core or Optional
PERFORMANCE CRITERIA	
1. Installs and uses appropriate tools for implementing, managing, and measuring software processes	Core
2. Collects data for software process assessments	Core
3. Analyzes process assessment data and implements improvement of software processes	Core
4. Creates and verifies preliminary hazard lists	Core
5. Uses software tools to build safety models	Core
6. Identifies safety requirements	Core
7. Implements design solutions to assure that the hazards are mitigated and the safety requirements are met	Core
8. Implements large code components and their interfaces using safe coding practices	Core
9. Collects safety QM data and reports the project status	Core

JOB FUNCTION 2: Supports the Principal Developer and team with mapping out requirement specifications, communicates with other key team members

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Internal and external product standards and requirements • Understanding of Software Requirement Specifications • Quality assurance methods • Programming languages • Application of software tools • Survey writing and requirement elicitation tools 	<ul style="list-style-type: none"> • Clear written documentation and record keeping • Communication with team members and external partners • Writing code • Listening and interpreting 	<ul style="list-style-type: none"> • Software to support coding and product development

Competency A: Coordinates with the Project Manager to communicate desired requirements and objectives clearly to other team members such as the UX team, QA testers, etc.	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies and engages stakeholders, under supervision, to determine needs and requirements	Core
2. Prepares surveys and other requirements elicitation tools	Core
3. Conducts domain analysis and selects the most appropriate domain analysis methods	Core
4. Develops requirements that ensure consistency with internal and external standards	Core
5. Clearly communicates results and suggestions to team members	Core

Competency B: Ensures proper use of desired Software Requirement Specification (SRS), and clearly defines and document the product requirements, under supervision	Core or Optional
PERFORMANCE CRITERIA	
1. Ensures the appropriate use of the Software Requirement Specification	Core
2. Develops documentation including descriptions of interfaces and requirements	Core
3. Selects the appropriate notations for describing interfaces and requirements	Core
4. Clearly records the product requirements using the appropriate documentation and notations	Core
Competency C: Supports the team/ QA testers in preliminary quality assurance requirements assessments & potential risk assessments, under supervision	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies the quality characteristics of a product	Core
2. Ensures that product-quality goals are achieved	Core
3. Collects quality metrics and prepares quality documentation to be distributed to appropriate stakeholders	Core
4. Performs tradeoff analysis of requirements activities	Core
5. Identifies security risks and creates requirements that capture security issues	Core
6. Models threats and associated risks of new systems	Core

JOB FUNCTION 3: Participates in and supports designing software or platform with the appropriate team

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Programming languages • Application of software tools • Understanding of software design structure • Understanding of software data models, system components, and algorithms • Understanding of prototype creation and application 	<ul style="list-style-type: none"> • Clear written documentations and record keeping • Collaborative work • Problem solving and logic • Writing code • Listening and interpreting 	<ul style="list-style-type: none"> • Software to support coding and product development

Competency A: Supports the UX team, or appropriate team members, with software design and structure of the software as it relates to implementation, its data models, interfaces between system components, and if applicable, the algorithms used, under supervision	Core or Optional
PERFORMANCE CRITERIA	
1. Selects the appropriate design methodology and strategies	Core
2. Applies enabling techniques in the design of software components	Core
3. Evaluates the effectiveness of the application of software design enabling techniques	Core
4. Applies appropriate design techniques in the areas of concurrency, event handling, data persistence, or distributed software	Core
5. Applies exception handling and fault tolerance techniques in the design of software components	Core
6. Uses restructuring and refactoring methods in the design of software components	Core
7. Contributes to architectural design tasks associated with use of standard notations, diagramming techniques, models, and patterns	Core

Competency B: Participates in the identification and development of the best prototype suited for the project, if any; supports identification of appropriate languages, operating systems, and monitoring methods applicable for the final program	Core or Optional
PERFORMANCE CRITERIA	
1. Develops and uses prototypes to evaluate software design quality	Core
2. Selects appropriate tools and techniques to ensure a software design's quality	Core
3. Selects appropriate languages and tools for software development	Core
4. Selects appropriate frameworks, platforms, and environments for software development	Core

JOB FUNCTION 4: Supports the development and assembly of the software, platform, or product

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Programming languages • Code logic • Application of software development tools • Source code management and version control • Understanding of internal and external coding standards 	<ul style="list-style-type: none"> • Writing code • Logic and problem solving • Listening and interpreting • Clear written documentations and record keeping • Collaborative work 	<ul style="list-style-type: none"> • Software to support coding and product development

Competency A: Applies best practices to the company-specific source code management processes	Core or Optional
PERFORMANCE CRITERIA	
1. Ensures source code management adheres to company-specific best practices	Core
2. Uses standard tools and processes for version control and configuration management	Core
Competency B: Continues to support identifying program and project changes or newfound needs as the software or system is formed, apply such project changes or needs effectively under direction from Principal Developer or applicable team members	Core or Optional
PERFORMANCE CRITERIA	
1. Evaluates the effectiveness of the application of the software design methods	Core
2. Identifies design alternatives and conducts trade-off analysis	Core
3. Facilitates software design reviews	Core
4. Implements static analysis tasks to evaluate design quality	Core
5. Uses result of quality evaluation activities to assess design quality and implement changes as needed	Core

Competency C: Participate in building the program using the appropriate languages and/or applicable development methods	Core or Optional
PERFORMANCE CRITERIA	
1. Applies the designated strategy and methodology to build a program	Core
2. Develops code to implement detailed design	Core
3. Refactors code as needed	Core
4. Applies project and organization standards to code	Core
5. Uses appropriate design patterns	Core
6. Uses defensive coding techniques to minimize errors and threats	Core
7. Thoroughly comments code to support software maintenance	Core

JOB FUNCTION 5: Supports testing and debugging; participates in integration and deployment

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS & TECHNOLOGIES
<ul style="list-style-type: none"> • Understanding of CI/CD integration • Understanding of prototype application • Programming languages • Application of software tools 	<ul style="list-style-type: none"> • Writing code • Logic and problem solving • Clear written documentation and record keeping • Listening and interpreting • Clear written documentations and record keeping • Collaborative work • Customer service 	<ul style="list-style-type: none"> • Software to support coding and product development

Competency A: Participates in recognizing concepts to determine CI/CD configuration, supports building and applying CI/ CD integrations for manual and/or automated functionalities	Core or Optional
PERFORMANCE CRITERIA	
1. Determines CI/CD configuration of a product	Core
2. Uses the appropriate concepts to build and apply CI/CD integrations for both manual and automated functionalities	Core
Competency B: Supports application of prototyping methods, if applicable	Core or Optional
PERFORMANCE CRITERIA	
1. Applies prototyping methods to support testing and debugging	Core
2. Uses the appropriate languages and operating systems when testing	Core
3. Captures and clearly communicates the results of testing using prototyping methods	Core
4. Uses the results of testing to make changes to software as needed	Core
Competency C: Supports close monitoring to identify issues and reports them in a clear and concise way to senior team members	Core or Optional
PERFORMANCE CRITERIA	

1. Gathers measures of code quality and size	Core
2. Creates and conducts unit tests for all code, adhering to project standards	Core
3. Achieves test coverage goals that meet project and organization standards	Core
4. Implements software maintenance processes and plans	Core
5. Monitors and analyzes software maintenance activities	Core
6. Clearly documents and communicates results of tests and monitoring to team members	Core
Competency D: After issue is reported, clearly tracks and works with team to fix, and re-test until quality standards are met	Core or Optional
PERFORMANCE CRITERIA	
1. Creates documentation in accordance with the quality management plan	Core
2. Conducts root cause analysis and assessment of review effectiveness	Core
3. Identifies necessary corrections in order to achieve product improvement	Core
4. Collects quality data under statistical control	Core
5. Works collaboratively with team members to implement documentation and improvement processes	Core
Competency E: Makes extensive, detailed notes when any changes are made and/or to clarify why a function must remain the same in a clear way for other team members	Core or Optional
PERFORMANCE CRITERIA	
1. Develops standards for documentation	Core
2. Clearly documents and tracks changes to software functions or code	Core
3. Effectively communicates the decision-making processes for changes to software functions or code	Core
Competency F: Participates in curating implementation preparation documents and plans	Core or Optional
PERFORMANCE CRITERIA	
1. Develops the criteria for unit test execution completion (e.g., code coverage, defect intensity)	Core
2. Creates unit test plans using the appropriate techniques	Core
3. Establishes criteria for demonstration readiness	Core
4. Develops demonstration test plan using the appropriate techniques	Core

5. Sets the criteria for test completion (e.g., defect arrival rate, defect intensity)	Core
6. Develops criteria for regression testing (e.g. defect density)	Core
7. Designs the necessary setup for testing and demonstration	Core
8. Creates appropriate documentation standards and uses them to track testing progress and outcomes	Core
Competency G: Supports integration and test phase, properly notes progress relevant to project success	Core or Optional
PERFORMANCE CRITERIA	
1. Conducts integration testing as part of the integration process	Core
2. Sets up build-and-install environments for software package integration	Core
3. Installs integration tools	Core
4. Creates code inspection packages	Core
5. Schedules code inspections	Core
6. Performs manual test activities (e.g., data entry, test case execution)	Core
7. Monitors customer feedback for product improvement during demonstrations	Core
8. Collects appropriate data associated with test execution	Core
9. Evaluates test execution results and identifies appropriate improvements	Core
Competency H: Participates in ongoing monitoring of platform, software, or application under project requirements, and supports with providing maintenance, troubleshooting assistance, and applies problem solving capabilities as applicable, under supervision	Core or Optional
PERFORMANCE CRITERIA	
1. Works collaboratively with other team members in development activities	Core
2. Applies problem solving and critical thinking skills to troubleshoot assistance	Core
3. Collects operational data	Core
4. Diagnoses and responds to reported software defects, anomalies, and operational incidents and events	Core
5. Performs operational software configuration management and assurance	Core
6. Updates software technologies to maintain currency	Core

STATEMENT OF INDEPENDENCE

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