PATHWAY: Network Systems

Pathway Topic: Network Systems Pathway

Pathway KS Statement: Identify and analyze customer/organizational network system needs and requirements.

Performance Element: Gather data to identify customer/organizational requirements.

Measurement Criteria: Gather data to identify customer requirement.
Measurement Criteria: Identify system and network requirements.
Measurement Criteria: Develop functional requirements/specifications for high-level systems.
Measurement Criteria: Identify security requirements.
Measurement Criteria: Identify time, technology, and resource constraints.
Measurement Criteria: Identify physical requirements for system implementation.
Measurement Criteria: Identify system requirements for various types of installations.
Measurement Criteria: Identify new application requirements within the system.
Measurement Criteria: Identify environment requirements, conditions and limitations.
Measurement Criteria: Determine required service level.
Measurement Criteria: Gather information using interviewing strategies.
Measurement Criteria: Identify input and output requirements.
Measurement Criteria: Identify system processing requirements.
Measurement Criteria: Clarify specifications using questioning techniques.
Measurement Criteria: Identify hardware, networking, and software system functional requirements.
Measurement Criteria: Demonstrate knowledge of nonfunctional requirements (e.g., security, integrity, response time, reliability, support, and documentation).

Performance Element: Conduct needs analysis.

Measurement Criteria: Gather information on problems from users.
Measurement Criteria: Perform workflow analysis to determine user needs.
Measurement Criteria: Analyze existing procedures.
Measurement Criteria: Define business problem to be solved by the application.
Measurement Criteria: Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts).

Performance Element: Develop networking requirements specification.

Measurement Criteria: Demonstrate knowledge of the use, structure, and contents of a requirements specification document.
Measurement Criteria: Define system and software requirements.
Measurement Criteria: Develop informal specifications.
Measurement Criteria: Develop formal specification.
Measurement Criteria: Evaluate installation requirements.
Measurement Criteria: Resolve conflicting requirements.
Measurement Criteria: Review and verify specification with customer.

Performance Element: Analyze requirements/specifications using current approaches.

Measurement Criteria: Analyze facilities' bandwidth requirements.
Pathway Topic: Network Systems Pathway

Measurement Criteria: Demonstrate knowledge of how to use software methodologies to analyze a real-world problem.

Measurement Criteria: Identify constraints.

Pathway KS Statement: Perform project management.

Performance Element: Produce strategies and plan to solve the specific network problem.

Measurement Criteria: Evaluate project requirements.
Measurement Criteria: Define scope of work to meet customer/organizational requirements.
Measurement Criteria: Conduct organizational planning for information system.
Measurement Criteria: Demonstrate knowledge of the key functions and subsystems of the network system.
Measurement Criteria: Demonstrate knowledge of the system life-cycle approach.

Performance Element: Create project plan.

Measurement Criteria: Demonstrate knowledge of project budgeting, scheduling, and control issues related to development and support of a network system.
Measurement Criteria: Prepare overall plan for integrating new processes, protocols, and equipment.
Measurement Criteria: Develop implementation plan.
Measurement Criteria: Identify tools and resources for the job.
Measurement Criteria: Identify and evaluate risks.
Measurement Criteria: Identify critical milestones.
Measurement Criteria: Identify interdependencies.
Measurement Criteria: Estimate time requirements.

Performance Element: Manage information system project methodologies.

Measurement Criteria: Define the project's contribution to business needs.
Measurement Criteria: Define the scope of the project.
Measurement Criteria: Identify stakeholders and decision makers.
Measurement Criteria: Identify escalation procedures.
Measurement Criteria: Develop task list (work breakdown structures).
Measurement Criteria: Evaluate project requirements and risks.
Measurement Criteria: Identify required resources and budget.
Measurement Criteria: Develop initial project management flowchart.
Measurement Criteria: Identify interdependencies.
Measurement Criteria: Identify and track critical milestones.
Measurement Criteria: Prepare contingency plan.
Measurement Criteria: Manage the change control process.
Measurement Criteria: Participate in project phase review.
Measurement Criteria: Report project status.
Measurement Criteria: Utilize project management software.

Pathway KS Statement: Analyze network system interdependencies and
Pathway Topic: Network Systems Pathway

Performance Element: Analyze the computer site environment.

**Measurement Criteria:** Identify power and power supplies.
**Measurement Criteria:** Define power conversion.
**Measurement Criteria:** Identify ergonomic issues.
**Measurement Criteria:** Identify Structural capacities and Electrical wiring codes.
**Measurement Criteria:** Analyze facilities' capacity planning (power cable/wire conduit).
**Measurement Criteria:** Evaluate emerging technologies as either potential effect on information system software/hardware.

Performance Element: Analyze network security systems.

**Measurement Criteria:** Identify security requirements and the need for data protection.
**Measurement Criteria:** Identify specific access levels that need to be accommodated.
**Measurement Criteria:** Match security system design to identified security requirements.
**Measurement Criteria:** Develop security plan.

Performance Element: Evaluate the correctness and effectiveness of implementing the network system.

**Measurement Criteria:** Evaluate user support outcomes to determine whether the problem was solved as intended.
**Measurement Criteria:** Evaluate whether the process was applied in an efficient and responsible manner.
**Measurement Criteria:** Assess the validity and usefulness of the outcomes.
**Measurement Criteria:** Determine needed follow-up actions.

Pathway KS Statement: Demonstrate knowledge of designing a network system.

Performance Element: Demonstrate knowledge of the basics of network architecture.

**Measurement Criteria:** Demonstrate knowledge of the characteristics and uses of network components (e.g., hub, switches, routers, firewall).
**Measurement Criteria:** Differentiate between a physical and logical topology.
**Measurement Criteria:** Demonstrate a basic knowledge of OSI modeling.
**Measurement Criteria:** Demonstrate knowledge of LAN transmission methods and standards.
**Measurement Criteria:** Demonstrate knowledge of LAN transmission protocols.
**Measurement Criteria:** Demonstrate knowledge of various frame types and formats.
**Measurement Criteria:** Differentiate processes, services, and protocols.

Performance Element: Demonstrate knowledge of basic network classifications and topologies.

**Measurement Criteria:** Differentiate between LANs, MANs, and WANs.
**Measurement Criteria:** Demonstrate knowledge of how to turn LANs into MANs and WANs.
**Measurement Criteria:** Identify the basic point-to-point network topologies (e.g., star, ring, tree, network, irregular).
Pathway Topic:  Network Systems Pathway

Measurement Criteria: Demonstrate knowledge of packet-switching techniques.

Measurement Criteria: Identify basic broadcast topologies (e.g., star, ring, bus).

Measurement Criteria: Demonstrate knowledge of characteristics of connection-oriented and connectionless networks.

Measurement Criteria: Identify stand high-speed network (e.g., broadband, ISDN, SMDS, ATM, FDDI).

Measurement Criteria: Identify emerging networks (e.g., ATM, ISDN, satellite nets, optic nets, integrated voice, data, and video).

Measurement Criteria: Investigate emerging technologies.

Measurement Criteria: Demonstrate knowledge of electronic communications (e.g., LAN, Internet, remote database access, EDI).

Measurement Criteria: Demonstrate knowledge of basic telephony (analog vs. digital signals).

Performance Element: Demonstrate knowledge of common network computing platforms.

Measurement Criteria: Identify how the four components of a network operating system (i.e., server platform, network services software, network redirection software, communications software) support network operations.

Measurement Criteria: Select a LAN/WAN technology that meets defined set of requirements.

Performance Element: Demonstrate knowledge of LAN physical media.

Measurement Criteria: Demonstrate knowledge of the reasons for installing a network.

Measurement Criteria: Demonstrate knowledge of local-area network (LAN) trends and issues.

Measurement Criteria: Trace the evolution of networks.

Measurement Criteria: Analyze current trends and development in LANs.

Performance Element: Demonstrate knowledge of network connectivity basis and transmission line applications.

Measurement Criteria: Demonstrate knowledge of the principles and operation of wire (coaxial, fiber optics, etc.) and wireless systems.

Measurement Criteria: Demonstrate knowledge of the principles and operation of fiber optics, analog and digital circuits.

Performance Element: Demonstrate knowledge of communication standards for networks.

Measurement Criteria: Demonstrate knowledge of the open system interconnection (OSI) standard (ISO Standard 7498).

Measurement Criteria: Identify standard high-speed networks (e.g., broadband, ISDN, SMDS, ATM, FDDI).

Measurement Criteria: Demonstrate knowledge of the TCP/IP protocol.

Performance Element: Demonstrate knowledge of WAN systems.

Measurement Criteria: Demonstrate knowledge of the conversion of analog speech to digital.

Measurement Criteria: Relate voice, data concepts, and video to video area networks.
Pathway Topic: Network Systems Pathway

Measurement Criteria: Select primary and backup data circuits.
Measurement Criteria: Evaluate analog and digital transmission for cost performance, and reliability.
Measurement Criteria: Demonstrate knowledge of firewall between trusted network and WAN.
Measurement Criteria: Establish a Virtual Private Network (VPN) to form the infrastructure of the WAN.
Measurement Criteria: Determine routers needed to connect with LAN.
Measurement Criteria: Demonstrate knowledge of interconnecting LANs using WAN services.

Performance Element: Demonstrate knowledge of network security systems.
Measurement Criteria: Demonstrate knowledge security requirements and the need for data protection.
Measurement Criteria: Demonstrate the knowledge of access levels that need to be accommodated.
Measurement Criteria: Develop security plan.

Performance Element: Demonstrate knowledge of Network Operating Systems.
Measurement Criteria: Demonstrate knowledge of the general characteristics of network operating systems.
Measurement Criteria: Demonstrate knowledge of network operating systems (i.e., window NT, LINUX, UNIX, etc.).

Pathway KS Statement: Perform network system installation and configuration.
Performance Element: Install system.
Measurement Criteria: Evaluate installation requirements.
Measurement Criteria: Install information system application programs in accordance with requirements.
Measurement Criteria: Install appropriate operating system and telecommunications hardware and software.
Measurement Criteria: Operate server applications.
Measurement Criteria: Ensure that all multi-user aspects of the application function are operational.
Measurement Criteria: Operate coupled application systems.

Performance Element: Perform software loading and configuration.
Measurement Criteria: Load software with minimum disruption of process flow.
Measurement Criteria: Resolve compatibility issues.
Measurement Criteria: Convert data.
Measurement Criteria: Configure software appropriately for system and user application.
Measurement Criteria: Add capability to a software system by recording macros and
Pathway Topic:  Network Systems Pathway

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storing them in the system's library.

Measurement Criteria: Customize a general-purpose software package (e.g., DBMS) to provide specific functionality beyond the default setting.

Measurement Criteria: Assemble necessary components to complement information system design.

Measurement Criteria: Install LAN Management software.

Pathway KS Statement: Perform network administration and monitoring.

Performance Element: Monitor the information/network system.

Measurement Criteria: Support network operating center (NOC).

Measurement Criteria: Monitor system status and performance.

Measurement Criteria: Conduct post-implementation evaluation.


Measurement Criteria: Identify required service level.

Measurement Criteria: Recognize system alerts.

Measurement Criteria: Recognize security problems.

Measurement Criteria: Recognize environmental problems.

Measurement Criteria: Perform remote monitoring.

Performance Element: Demonstrate knowledge of disaster recovery and business continuance.

Measurement Criteria: Differentiate between disaster recovery and business resumption.

Measurement Criteria: Identify the steps in a disaster recovery plan and a business resumption plan.

Measurement Criteria: Identify methods for avoiding common computer system disasters.

Measurement Criteria: Identify common backup devices.

Measurement Criteria: Identify the criteria for selecting a backup system.

Measurement Criteria: Compare/contract streaming and file-by-file backup systems.

Measurement Criteria: Establish process for archiving files.

Measurement Criteria: Develop a disaster recovery plan.

Measurement Criteria: Develop a business resumption plan.

Measurement Criteria: Backup system.

Measurement Criteria: Restore system.

Performance Element: Perform network system administration tasks.

Measurement Criteria: Identify principles governing software acquisition and upgrades.

Measurement Criteria: Manage inventory and assets.

Measurement Criteria: Retrieve/analyze historical data for trends analysis.

Measurement Criteria: Perform administration functions using LAN manager software.

Measurement Criteria: Response to system messages.

Pathway KS Statement: Perform network maintenance and user support services.

Performance Element: Identify technical support needed.
Pathway Topic: Network Systems Pathway

Measurement Criteria: Identify support requirements.
Measurement Criteria: Apply information and data analysis techniques.
Measurement Criteria: Identify skill level needs.
Measurement Criteria: Define scope of work to meet customer needs.
Measurement Criteria: Identify resources and risks.
Measurement Criteria: Evaluate present data and system configuration.
Measurement Criteria: Formulate a support plan.

Performance Element: Perform technical support needed.
Measurement Criteria: Respond to user questions.
Measurement Criteria: Communicate and document technical support provided.
Measurement Criteria: Perform technical functions required by customer/user.
Measurement Criteria: Employ technical and computer tools to perform task in the most cost-effective manner.
Measurement Criteria: Manage working relationships with customer within support boundaries.
Measurement Criteria: Balance resource against customer/user needs.
Measurement Criteria: Manage multiple customer requirements.
Measurement Criteria: Participate in application and system development reviews.

Performance Element: Perform software upgrades and fixes.
Measurement Criteria: Analyze operational problems.
Measurement Criteria: Install and configure Internet software packages.
Measurement Criteria: Upgrade network system software.

Performance Element: Perform standard computer backup procedures.
Measurement Criteria: Recognize the need for regular backup procedures.
Measurement Criteria: Develop backup process.
Measurement Criteria: Load backup software.
Measurement Criteria: Perform restore operation using backup software
Measurement Criteria: Identify battery backup equipment.
Measurement Criteria: Maintain battery backup system.
Measurement Criteria: Install surge suppression protection.

Performance Element: Perform network system maintenance.
Measurement Criteria: Demonstrate knowledge of the basic elements of network maintenance.
Measurement Criteria: Identify available diagnostic tools used for system maintenance.
Measurement Criteria: Identify maintenance procedures and processes.
Measurement Criteria: Identify problems using diagnostic tools.
Measurement Criteria: Run diagnostics.
Measurement Criteria: Respond to system messages.
Measurement Criteria: Document network system malfunction(s).
Measurement Criteria: Fix recoverable problems.
Measurement Criteria: Perform preventive maintenance procedures on computer and peripheral devices.
Pathway Topic: Network Systems Pathway

**Measurement Criteria:**
- Restore system.
- Identify new or replacement networking components needed.
- Establish a preventive maintenance plan.
- Create maintenance plan for regular integrity checks.
- Identify maintenance procedures and processes.
- Evaluate maintenance processes and outcomes.
- Select most appropriate solution.
- Minimize impact of problems on productivity (e.g., minimize downtime).

Performance Element: Troubleshoot problems.

**Measurement Criteria:**
- Demonstrate knowledge of basic troubleshooting steps.
- Identify available diagnostic tools used for system maintenance.
- Perform appropriate analysis to identify problem cause.
- Develop resolution plan.
- Identify possible solutions.
- Test identified solutions.
- Detect problems.
- Identify criticality of problem.
- Identify problems using diagnostic tools.
- Document results & solution.

Performance Element: Troubleshoot data communications.

**Measurement Criteria:**
- Isolate system faults in various types of networks, cables, data modems, and carrier systems.
- Determine hardware communication faults utilizing diagnostic tools.
- Identify network problems utilizing network management tools (e.g., hardware, software carriers).
PATHWAY: Information Support and Services

Pathway Topic: Information Support & Services Pathway

Pathway KS Statement: Perform computer user support.

Performance Element: Analyze technical support needed.
Measurement Criteria: Identify support requirements.
Measurement Criteria: Apply information and data analysis techniques.
Measurement Criteria: Identify skill level needs.
Measurement Criteria: Define scope of work to meet customer needs.
Measurement Criteria: Identify resources and risks.
Measurement Criteria: Evaluate present data and system configuration.
Measurement Criteria: Formulate a support plan.
Measurement Criteria: Communicate and document technical support provided.

Performance Element: Perform customer service.
Measurement Criteria: Provide high-level technical support.
Measurement Criteria: Respond to user questions
Measurement Criteria: Provide troubleshooting for hardware/software.
Measurement Criteria: Diagnose problems within system.
Measurement Criteria: Perform technical functions required by customer/user.
Measurement Criteria: Employ technical and computer tools to perform task in the most cost-effective manner.
Measurement Criteria: Manage working relationships with customer within support boundaries.
Measurement Criteria: Balance resources against customer needs.
Measurement Criteria: Manage multiple customer requirements.

Pathway KS Statement: Manage software systems.

Performance Element: Perform configuration management activities.
Measurement Criteria: Demonstrate knowledge of identification and control functions.
Measurement Criteria: Demonstrate knowledge of version management and interface control.
Measurement Criteria: Select appropriate tools for configuration management.
Measurement Criteria: Determine standards to be applied (e.g., international, industry, military).
Measurement Criteria: Specify baseline and software life-cycle phases.
Measurement Criteria: Assess the impact of changes that affect interfaces.

Performance Element: Evaluate application software packages.
Measurement Criteria: Perform work flow analysis to determine user needs.
Measurement Criteria: Evaluate appropriateness of software for specific projects.
Measurement Criteria: Prepare a cost-benefit analysis for a software package.
Measurement Criteria: Document results of the software evaluation.
Measurement Criteria: Perform a software configuration audit.
Measurement Criteria: Perform a physical configuration audit.
Measurement Criteria: Develop a method for evaluation.
Measurement Criteria: Test the functionality of proposed software configuration.
Pathway Topic: Information Support & Services Pathway

Pathway KS Statement: Demonstrate and apply knowledge of web programming and hosting.

Performance Element: Demonstrate knowledge of Internet programming basics.

Measurement Criteria: Recognize the importance of Internet programming standards.
Measurement Criteria: Demonstrate knowledge of standard Internet programming coding.
Measurement Criteria: Demonstrate knowledge of special Internet programming feature codes.
Measurement Criteria: Differentiate between various versions of Internet programming.
Measurement Criteria: Demonstrate knowledge of how to use standard programs to produce an Internet application.
Measurement Criteria: Identify authoring programs specifically designed for Internet programming production.
Measurement Criteria: Compare/contrast features, strengths, and weaknesses of different authoring programs.
Measurement Criteria: Identify cross-platform issues.
Measurement Criteria: Keep up-to-date with new and emerging trends related to Internet programming.

Performance Element: Apply knowledge of basic web programming.

Measurement Criteria: Demonstrate knowledge of the purpose of web content delivery enablers (e.g., CGI, API, SSI).
Measurement Criteria: Demonstrate knowledge of how to interface client/server.
Measurement Criteria: Demonstrate knowledge of client-side processing and its advantages/disadvantages.
Measurement Criteria: Identify security issues related to client-side processing.
Measurement Criteria: Identify standard scripting languages (e.g., JavaScript, Visual Basic Script, ActiveX).
Measurement Criteria: Demonstrate knowledge of the uses and advantages/disadvantages of various scripting languages.
Measurement Criteria: Demonstrate knowledge of how to use a scripting language to program a site.
Measurement Criteria: Demonstrate knowledge of how to use advanced communication protocols.

Performance Element: Apply knowledge of web hosting.

Measurement Criteria: Compare the advantages and disadvantages of running your own server vs. using a server provider.
Measurement Criteria: Identify hardware requirements for a server.
Measurement Criteria: Identify server software options.
Measurement Criteria: Evaluate server providers.
Measurement Criteria: Establish a domain name.
Measurement Criteria: Upload files to the server.
Pathway Topic: Information Support & Services Pathway

Measurement Criteria: Publicize the site (e.g., submit announcements to major search engines).

Measurement Criteria: Collect/analyze usage statistics.

Pathway KS Statement: Demonstrate and apply knowledge of hardware design, operation and maintenance.

Performance Element: Demonstrate knowledge of CPU components.

Measurement Criteria: Demonstrate knowledge of chip configuration and structure.

Measurement Criteria: Demonstrate knowledge of the functions of internal components (e.g., motherboards, co-processor boards, memory devices).

Measurement Criteria: Demonstrate knowledge of the characteristics and operation of controller and network interface cards.

Measurement Criteria: Demonstrate knowledge of circuits, logic elements and switching theory, including minimization concepts and implementation of functions.

Performance Element: Install computer system (e.g., monitor, keyboard, disk drive, and printer).

Measurement Criteria: Identify primary PC components and the functions of each.

Measurement Criteria: Demonstrate knowledge of how hardware components interact and how conflicts arise.

Measurement Criteria: Access needed information using manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts).

Measurement Criteria: Secure supplies and resources.

Measurement Criteria: Respond to error messages and symptoms of hardware failures.

Measurement Criteria: Install boards to support peripherals.

Measurement Criteria: Connect peripherals to CPU.

Measurement Criteria: Employ appropriate safety precautions when working with PCs.

Measurement Criteria: Configure system.

Measurement Criteria: Verify system operation.

Measurement Criteria: Document system installation activities.

Measurement Criteria: Backup system configuration.

Measurement Criteria: Test all applications.

Performance Element: Troubleshoot computer systems.

Measurement Criteria: Identify priorities and interrupts at system level.

Measurement Criteria: Demonstrate the use of volatile and nonvolatile memory.

Measurement Criteria: Repair/replace volatile and nonvolatile memory.

Measurement Criteria: Test system using diagnostic tools/software.

Measurement Criteria: Identify problems in the operating system and related hardware.

Measurement Criteria: Differentiate between hardware and software failure.

Measurement Criteria: Update flash memory (BIOS).

Measurement Criteria: Optimize hard drive.
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Pathway Topic: Information Support & Services Pathway

Measurement Criteria: Gather information on problem from user.
Measurement Criteria: Conduct appropriate diagnostic tests.
Measurement Criteria: Repair/replace malfunctioning hardware.
Measurement Criteria: Reinstall software as needed.
Measurement Criteria: Recover data and/or files.
Measurement Criteria: Restore system to normal operating standards.

Pathway KS Statement: Demonstrate knowledge of programming theory.
Performance Element: Demonstrate knowledge of programming language concepts.

Measurement Criteria: Demonstrate knowledge of the concept of physical representation of digitized information (e.g., data, text, image, voice).
Measurement Criteria: Demonstrate knowledge of the hardware-software connection.
Measurement Criteria: Demonstrate knowledge of the concepts of data and procedural representation.
Measurement Criteria: Demonstrate knowledge of the function and operation of compilers and interpreters.
Measurement Criteria: Demonstrate knowledge of the basic principles for analyzing a programming language.
Measurement Criteria: Demonstrate knowledge of the basics of structured, object-oriented, and event-driven programming.
Measurement Criteria: Demonstrate knowledge of how a programming language can support multitasking and exception-handling.
Measurement Criteria: Demonstrate knowledge of current key programming languages and the environment they are used in (e.g., C, C++, Visual Basic, Java, RPG, COBOL, Assembler).

Performance Element: Demonstrate knowledge of the stages of program development.

Measurement Criteria: Identify the use of program design tools.
Measurement Criteria: Demonstrate knowledge of structured/modular programming.
Measurement Criteria: Demonstrate knowledge of the information system (IS) life cycle.

Performance Element: Demonstrate knowledge of technical documentation associated with software development.

Measurement Criteria: Analyze specifications.
Measurement Criteria: Identify constraints.
Measurement Criteria: Identify input and output (I/O) requirements.
Measurement Criteria: Prepare logic using a program flowchart.

Pathway KS Statement: Demonstrate knowledge of networking concepts.
Performance Element: Demonstrate knowledge of basic network classifications and topologies.

Measurement Criteria: Interpret basic networking terminology.
Pathway Topic: Information Support & Services Pathway

Measurement Criteria: Differentiate between LANs, MANs and WANs.
Measurement Criteria: Demonstrate knowledge of how to turn LANs into MANs and WANs.
Measurement Criteria: Identify the basic point-to-point network topologies (e.g., star, ring, tree, network, irregular).
Measurement Criteria: Demonstrate knowledge of packet-switching techniques.
Measurement Criteria: Identify the basic broadcast topologies (e.g., star, ring, bus).

Performance Element: Demonstrate knowledge of the basics of network architecture.

Measurement Criteria: Demonstrate knowledge of the characteristics and uses of network components (e.g., hub, switches, routers, firewall).
Measurement Criteria: Differentiate between a physical and logical topology.
Measurement Criteria: Demonstrate a basic knowledge of OSI modeling.
Measurement Criteria: Demonstrate knowledge of LAN transmission methods, standards and protocols.
Measurement Criteria: Demonstrate knowledge of various frame types and formats.

Performance Element: Demonstrate knowledge of the general characteristics of network operating systems.

Measurement Criteria: Identify the purposes of a network operating system (NOS).
Measurement Criteria: Differentiate between network operating systems and data distribution systems.
Measurement Criteria: Identify how the four components of a network operating system (i.e., server platform, network services software, network redirection software, communications software) support network operations.
Measurement Criteria: Define the criteria used to evaluate network operating systems.
Measurement Criteria: Identify how protocols are supported.
Measurement Criteria: Identify licensing requirements.
Measurement Criteria: Demonstrate knowledge of the characteristics of the client/server models.
Measurement Criteria: Analyze the advantages and disadvantages of the client/server model.
Measurement Criteria: Demonstrate knowledge of a typical program function call.
Measurement Criteria: Identify the properties of open systems.
Measurement Criteria: Demonstrate knowledge of LAN connectivity issues.

Performance Element: Demonstrate knowledge of network applications.

Measurement Criteria: Demonstrate knowledge of how disk storage is shared across a network.
Measurement Criteria: Demonstrate knowledge of how processing power is shared across a network.
Measurement Criteria: Demonstrate knowledge of application-specific servers (e.g., database, print, communications, terminal, fax, security).
Measurement Criteria: Identify the advantages of sharing backup and management of PCs across a network.
Measurement Criteria: Identify software licensing requirements and categories.
Pathway Topic: Information Support & Services Pathway

Pathway KS Statement: Demonstrate knowledge of application development lifecycle.

Performance Element: Conduct needs analysis.

- **Measurement Criteria:** Define business problem to be solved by the application (e.g., through interview process).
- **Measurement Criteria:** Identify scope of project.
- **Measurement Criteria:** Access needed information using company procedural manuals, references, documentation, and standards.
- **Measurement Criteria:** Define business information requirements.
- **Measurement Criteria:** Align information system (IS) design with the business process.
- **Measurement Criteria:** Determine hardware and software needs.
- **Measurement Criteria:** Interpret source data, charts, and graphs.
- **Measurement Criteria:** Review organizational structure.
- **Measurement Criteria:** Interpret existing operating documents and procedures for the system.
- **Measurement Criteria:** Observe existing procedures.
- **Measurement Criteria:** Document existing procedures.
- **Measurement Criteria:** Document possible alternative solutions.
- **Measurement Criteria:** Identify processing requirements.
- **Measurement Criteria:** Define variables.
- **Measurement Criteria:** Analyze specifications.
- **Measurement Criteria:** Review organizational structure.
- **Measurement Criteria:** Present findings and recommendations to users and management (e.g., work plan, project estimate).

Pathway KS Statement: Demonstrate and apply knowledge of Information System Analysis and Design

Performance Element: Initiate a system project.

- **Measurement Criteria:** Identify the phases in a system project.
- **Measurement Criteria:** Select basic fact-gathering techniques to be used.
- **Measurement Criteria:** Define the scope of the systems project.
- **Measurement Criteria:** Conduct a preliminary investigation.

Performance Element: Evaluate applications within the information system.

- **Measurement Criteria:** Design a framework for evaluating information system functions.
- **Measurement Criteria:** Design a framework for evaluating individual applications.
- **Measurement Criteria:** Recommend new features or enhancements to existing tools.

Pathway KS Statement: Demonstrate and apply knowledge of System Installation and Maintenance.

Performance Element: Apply knowledge of the life cycle of an information system.

- **Measurement Criteria:** Research the concept of information system life cycles.

Performance Element: Manage backup and recovery, both on- and off-site.

- **Measurement Criteria:** Implement backup procedures in accordance with a regular schedule.
Pathway Topic: Information Support & Services Pathway

**Measurement Criteria:** Implement recovery procedures as needed.

**Performance Element:** Troubleshoot problems.

**Measurement Criteria:** Demonstrate knowledge of basic troubleshooting steps.

**Measurement Criteria:** Minimize impact of problems on productivity (e.g., minimize downtime).

**Performance Element:** Evaluate problem-solving processes and outcomes.

**Measurement Criteria:** Evaluate problem-solving outcomes to determine whether the problem was solved as intended.

**Measurement Criteria:** Evaluate whether the process was applied in an efficient and responsible manner.

**Measurement Criteria:** Assess the validity and usefulness of the outcomes.

**Measurement Criteria:** Determine needed follow-up actions.

**Pathway KS Statement:** Demonstrate knowledge of System Administration and Control.

**Performance Element:** Perform general system administration tasks.

**Measurement Criteria:** Facilitate the delivery of technical services.

**Measurement Criteria:** Set up/maintain user accounts on multiple systems.

**Measurement Criteria:** Participate in the evaluation, analysis, and recommendation of technical computing products.

**Measurement Criteria:** Document performance problems.

**Measurement Criteria:** Prepare required reports.

**Measurement Criteria:** Maintain technical industry knowledge.

**Pathway KS Statement:** Demonstrate and apply knowledge of Project Management.

**Performance Element:** Define scope of work to achieve individual and group goals.

**Measurement Criteria:** Assess the task's contribution to overall business needs.

**Measurement Criteria:** Identify size and specifics of the task.

**Measurement Criteria:** Formulate task sequence.

**Measurement Criteria:** Plan multiple tasks simultaneously.

**Measurement Criteria:** Identify potential problems.

**Measurement Criteria:** Develop contingency plans.

**Performance Element:** Manage information system project methodologies.

**Measurement Criteria:** Define the project's contribution to business needs.

**Measurement Criteria:** Define the scope of the project.

**Measurement Criteria:** Identify stakeholders and decision makers.

**Measurement Criteria:** Identify escalation procedures.

**Measurement Criteria:** Develop task list (work breakdown structures).

**Measurement Criteria:** Evaluate project requirements.

**Measurement Criteria:** Identify required resources and budget.

**Measurement Criteria:** Estimate time requirements.

**Measurement Criteria:** Develop initial project management flowchart.

**Measurement Criteria:** Identify interdependencies.
Information Technology

Pathway Topic: Information Support & Services Pathway

- **Measurement Criteria:** Identify critical milestones.
- **Measurement Criteria:** Evaluate risks.
- **Measurement Criteria:** Prepare contingency plan.
- **Measurement Criteria:** Manage the change control process.
- **Measurement Criteria:** Track critical milestones.
- **Measurement Criteria:** Participate in project phase review.
- **Measurement Criteria:** Report project status.
- **Measurement Criteria:** Utilize project management software.
- **Measurement Criteria:** Develop a method of evaluation.

**Performance Element:** Develop time and activity plan to achieve objective.

- **Measurement Criteria:** Coordinate plan with team, cross-functional groups, or individuals.
- **Measurement Criteria:** Formulate a task strategy.
- **Measurement Criteria:** Prioritize tasks according to business needs.
- **Measurement Criteria:** Manage multiple tasks simultaneously.
- **Measurement Criteria:** Devise plan of action.

**Pathway KS Statement:** Demonstrate and apply knowledge of Technical Writing and Documentation.

**Performance Element:** Evaluate technical writing requirements.

- **Measurement Criteria:** Define/prioritize communication needs.
- **Measurement Criteria:** Specify project objectives.
- **Measurement Criteria:** Determine the size and specifics of the work to be completed.
- **Measurement Criteria:** Estimate time, materials, and capabilities needed to complete assignment.
- **Measurement Criteria:** Evaluate strengths and weaknesses of completed project.

**Performance Element:** Conduct technical research.

- **Measurement Criteria:** Identify target audience.
- **Measurement Criteria:** Define research questions.
- **Measurement Criteria:** Determine priorities for the information that should be gathered.
- **Measurement Criteria:** Identify potential sources of information.
- **Measurement Criteria:** Target audience/user group as a key information source.
- **Measurement Criteria:** Identify subject-matter experts.
- **Measurement Criteria:** Evaluate potential sources of information based on established criteria (e.g., affordability, relevance).
- **Measurement Criteria:** Conduct interviews with selected human information sources.
- **Measurement Criteria:** Gather information from selected print and electronic sources.
- **Measurement Criteria:** Determine the accuracy and completeness of the information gathered.

**Performance Element:** Design technical documentation.

- **Measurement Criteria:** Define purpose of documentation.
- **Measurement Criteria:** Specify standards for documentation, including critical success criteria.
Pathway Topic: Information Support & Services Pathway

**Measurement Criteria:** Identify delivery options.
**Measurement Criteria:** Evaluate cost-effectiveness of each delivery option.
**Measurement Criteria:** Select tools appropriate for task purpose.
**Measurement Criteria:** Plan information flow.
**Measurement Criteria:** Select writing style and tone appropriate for given documentation.
**Measurement Criteria:** Determine level of detail needed.
**Measurement Criteria:** Identify visuals appropriate for given documentation.
**Measurement Criteria:** Provide feedback on design to development team/individual.

**Performance Element:** Write technical reports.

**Measurement Criteria:** Determine audience.
**Measurement Criteria:** Access needed information using standard references and sources.
**Measurement Criteria:** Identify type of report needed.
**Measurement Criteria:** Compile relevant data.
**Measurement Criteria:** Organize data into charts and graphs.
**Measurement Criteria:** Analyze data.
**Measurement Criteria:** Draw conclusions from data analysis.
**Measurement Criteria:** Outline report.
**Measurement Criteria:** Draft report.
**Measurement Criteria:** Edit report (e.g., check spelling, grammar, punctuation, sentence structure, accuracy of content).
**Measurement Criteria:** Review report with peers.
**Measurement Criteria:** Revise report as needed based on peer feedback.
**Measurement Criteria:** Proofread revised report.
**Measurement Criteria:** Present reports.

**Pathway KS Statement:** Understand and implement Quality Assurance processes.

**Performance Element:** Employ quality tools.

**Measurement Criteria:** Demonstrate knowledge of the characteristics and functions of available quality tools.
**Measurement Criteria:** Select quality tool(s) appropriate to situation.

**Performance Element:** Apply knowledge of quality cost implications.

**Measurement Criteria:** Establish cost/quality objectives.
**Measurement Criteria:** Classify costs (e.g., direct and indirect, fixed and variable, methods and standards).
**Measurement Criteria:** Classify quality costs (e.g., prevention, evaluation, pre-delivery failure, post-delivery failure).
**Measurement Criteria:** Interpret quality cost reports.
**Measurement Criteria:** Establish guidelines for liability prevention.
**Measurement Criteria:** Identify safety terms of product.
**Measurement Criteria:** Identify safety responsibility within organization.
PATHWAY: Interactive Media

Pathway Topic: Interactive Media Pathway

Pathway KS Statement: Gather and analyze interactive media customer requirements.

Performance Element: Gather data to identify customer requirements.

Measurement Criteria: Gather information using interviewing strategies.

Measurement Criteria: Determine client’s needs and expected outcomes.

Performance Element: Interpret and evaluate requirements.

Measurement Criteria: Determine purpose of the interactive media project.

Measurement Criteria: Determine the target audience.

Measurement Criteria: Determine the interactive media elements to be used.

Pathway KS Statement: Define scope of interactive media work in written form.

Performance Element: Define scope of work to meet customer requirements.

Measurement Criteria: Develop a design brief.

Measurement Criteria: Identify available media and content sources.

Measurement Criteria: Develop time line for completion.

Measurement Criteria: Determine staffing resources – internal and external - required to complete project.

Measurement Criteria: Develop preliminary project budget.

Measurement Criteria: Write document.

Measurement Criteria: Obtain client approval on scope of work.

Pathway KS Statement: Create interactive media product specifications.

Performance Element: Prepare functional specifications.

Measurement Criteria: Develop flowchart/navigational blueprints.

Measurement Criteria: Determine delivery platform(s).

Measurement Criteria: Design system architecture.

Measurement Criteria: Design user interface.

Measurement Criteria: Design navigational schema.

Performance Element: Prepare visual design specifications.

Measurement Criteria: Apply principles of design.

Measurement Criteria: Identify technical constraints.

Measurement Criteria: Create sample design showing placement of buttons/navigational graphics and suggested color scheme.

Performance Element: Create final project plan.

Measurement Criteria: Identify and obtain tools and resources to do the job.

Measurement Criteria: Identify and evaluate risks.

Measurement Criteria: Develop detailed task list.

Measurement Criteria: Identify critical milestones.

Measurement Criteria: Identify interdependencies.

Pathway KS Statement: Demonstrate and apply knowledge of Project Management.

Performance Element: Manage information system project methodologies.
Pathway Topic: Interactive Media Pathway

Measurement Criteria: Define the project's contribution to business needs.
Measurement Criteria: Define the scope of the project.
Measurement Criteria: Identify stakeholders and decision makers.
Measurement Criteria: Identify escalation procedures.
Measurement Criteria: Develop task list (work breakdown structures).
Measurement Criteria: Evaluate project requirements.
Measurement Criteria: Identify required resources and budget.
Measurement Criteria: Estimate time requirements.
Measurement Criteria: Develop initial project management flowchart.
Measurement Criteria: Identify interdependencies.
Measurement Criteria: Identify critical milestones.
Measurement Criteria: Evaluate risks.
Measurement Criteria: Prepare contingency plan.
Measurement Criteria: Manage the change control process.
Measurement Criteria: Track critical milestones.
Measurement Criteria: Participate in project phase review.
Measurement Criteria: Report project status.
Measurement Criteria: Utilize project management software.

Performance Element: Define scope of work to achieve individual and group goals.

Measurement Criteria: Assess the task's contribution to overall business needs.
Measurement Criteria: Identify size and specifics of the task.
Measurement Criteria: Formulate task sequence.
Measurement Criteria: Plan multiple tasks simultaneously.
Measurement Criteria: Identify potential problems.
Measurement Criteria: Develop contingency plans.

Performance Element: Develop time and activity plan to achieve objectives.

Measurement Criteria: Coordinate plan with team, cross-functional groups, or individuals.
Measurement Criteria: Formulate a task strategy.
Measurement Criteria: Prioritize tasks according to business needs.
Measurement Criteria: Manage multiple tasks simultaneously.
Measurement Criteria: Devise plan of action.

Pathway KS Statement: Demonstrate the effective use of tools for interactive media production, development and project management.

Performance Element: Select and utilize appropriate software tools.

Measurement Criteria: Demonstrate proficiency in the use of digital imaging techniques and equipment.
Measurement Criteria: Synthesize available interactive media technologies into a unified presentation using appropriate authoring software.
Measurement Criteria: Demonstrate knowledge of available graphics software programs.
Measurement Criteria: Manipulate images.
Pathway Topic: Interactive Media Pathway

Measurement Criteria: Demonstrate knowledge of the basic principles of animation.
Measurement Criteria: Identify how different browsers affect the look of a web page.

Pathway KS Statement: Demonstrate and apply knowledge of web programming and hosting.

Performance Element: Demonstrate knowledge of Internet programming basics.

Measurement Criteria: Recognize the importance of Internet programming standards.
Measurement Criteria: Demonstrate knowledge of standard Internet programming coding.
Measurement Criteria: Demonstrate knowledge of special Internet programming feature codes.
Measurement Criteria: Differentiate between various versions of Internet programming.
Measurement Criteria: Demonstrate knowledge of how to use standard programs to produce an Internet application.
Measurement Criteria: Identify authoring programs specifically designed for Internet programming production.
Measurement Criteria: Compare/contrast features, strengths, and weaknesses of different authoring programs.
Measurement Criteria: Identify cross-platform issues.
Measurement Criteria: Keep up-to-date with new and emerging trends related to Internet programming.

Performance Element: Apply knowledge of basic web programming.

Measurement Criteria: Demonstrate knowledge of the purpose of web content delivery enablers (e.g., CGI, API, SSI).
Measurement Criteria: Demonstrate knowledge of how to interface client/server.
Measurement Criteria: Demonstrate knowledge of client-side processing and its advantages/disadvantages.
Measurement Criteria: Identify security issues related to client-side processing.
Measurement Criteria: Identify standard scripting languages (e.g., JavaScript, Visual Basic Script, ActiveX).
Measurement Criteria: Demonstrate knowledge of the uses and advantages/disadvantages of various scripting languages.
Measurement Criteria: Demonstrate knowledge of how to use a scripting language to program a site.
Measurement Criteria: Demonstrate knowledge of how to use advanced communication protocols.

Performance Element: Apply knowledge of web hosting.

Measurement Criteria: Compare the advantages and disadvantages of running your own server vs. using a server provider.
Measurement Criteria: Identify hardware requirements for a server.
Measurement Criteria: Identify server software options.
Measurement Criteria: Evaluate server providers.
Measurement Criteria: Establish a domain name.
Measurement Criteria: Comply with TCP/IP (Transfer Control Protocol/Internet
Pathway Topic: Interactive Media Pathway

**Protocol.**

**Measurement Criteria:** Upload files to the server.

**Measurement Criteria:** Publicize the site (e.g., submit announcements to major search engines).

**Measurement Criteria:** Collect/analyze usage statistics.

**Pathway KS Statement:** Create/implement interactive media product.

**Performance Element:** Produce interactive media as member of a development team.

**Measurement Criteria:** Define the role of individual team members.

**Measurement Criteria:** Develop a conceptual model for the interactive media project.

**Measurement Criteria:** Select the media elements (e.g., sound, video, graphics, text, animation) to be used.

**Measurement Criteria:** Integrate media elements.

**Measurement Criteria:** Select the publication process to be used.

**Measurement Criteria:** Select the distribution method to be used.

**Performance Element:** Implement functional design criteria.

**Measurement Criteria:** Identify, utilize and create reusable components.

**Measurement Criteria:** Create and produce content.

**Measurement Criteria:** Create and refine design concepts.

**Performance Element:** Create product visual design.

**Measurement Criteria:** Apply principles and elements of design.

**Measurement Criteria:** Apply color theory to select appropriate colors.

**Measurement Criteria:** Create and/or implement the look and feel of the product.

**Measurement Criteria:** Create graphical images.

**Measurement Criteria:** Apply knowledge of typography.

**Measurement Criteria:** Enhance interactive media presentation using a photographic process.

**Measurement Criteria:** Alter digitized images using an image manipulation program.

**Measurement Criteria:** Evaluate visual appeal.

**Performance Element:** Produce or acquire content.

**Measurement Criteria:** Produce or acquire graphics content.

**Measurement Criteria:** Produce or acquire animation content.

**Measurement Criteria:** Produce or acquire audio content.

**Measurement Criteria:** Produce or acquire video content.

**Performance Element:** Apply knowledge of web programming.

**Measurement Criteria:** Demonstrate knowledge of Internet programming codes for formatting page layout.

**Measurement Criteria:** Demonstrate knowledge of the purpose of web content delivery enablers (e.g., CGI, API, SSI).

**Measurement Criteria:** Demonstrate knowledge of how to interface client/server.

**Measurement Criteria:** Demonstrate knowledge of client-side processing and its advantages/disadvantages.

**Measurement Criteria:** Identify security issues related to client-side processing.

**Measurement Criteria:** Identify standard scripting languages (e.g., JavaScript, Visual
Pathway Topic: Interactive Media Pathway

**Measurement Criteria:** Demonstrate knowledge of the uses and advantages/disadvantages of various scripting languages.

**Measurement Criteria:** Demonstrate knowledge of how to use a scripting language to program a site.

**Measurement Criteria:** Demonstrate knowledge of how to use advanced communication protocols.

**Measurement Criteria:** Demonstrate knowledge of how bandwidths affect data transmission and on-screen image.

**Measurement Criteria:** Keep up-to-date with new and emerging trends related to Internet programming.

Performance Element: Integrate media elements.

**Measurement Criteria:** Integrate the use of photographic special effects into interactive media presentations.

**Measurement Criteria:** Integrate photographically derived images with hand-drawn graphic images.

Performance Element: Participate in iterative development with clients and team members.

**Measurement Criteria:** Manage the change control process.

**Measurement Criteria:** Identify and track critical milestones.

**Measurement Criteria:** Report project status.

**Pathway KS Statement:** Test interactive media product.

Performance Element: Develop and implement a test plan.

**Measurement Criteria:** Perform usability tests.

**Measurement Criteria:** Assess product effectiveness.

**Measurement Criteria:** Test product for reliability.

**Measurement Criteria:** Plan and coordinate customer acceptance testing.

Performance Element: Resolve product problems.

**Measurement Criteria:** Define the problem.

**Measurement Criteria:** Identify/test possible solutions.

**Measurement Criteria:** Develop resolution plan.

**Measurement Criteria:** Implement solution.

**Measurement Criteria:** Evaluate problem solving processes and outcomes.

**Pathway KS Statement:** Deliver a quality interactive media product.

Performance Element: Demonstrate knowledge of interactive media quality assurance.

**Measurement Criteria:** Demonstrate knowledge of the QA process.

**Measurement Criteria:** Demonstrate knowledge of the standards/requirements for QA.

**Measurement Criteria:** Develop team relationships to support quality assurance tasks.

Performance Element: Perform quality assurance tasks to produce a quality product.

**Measurement Criteria:** Use customer satisfaction in determining product characteristics (e.g., cost, user-friendliness).

**Measurement Criteria:** Recognize the relationship between dependability,
Pathway Topic: Interactive Media Pathway

Functionality, ease of use, etc.

Measurement Criteria: Follow established procedures for testing, identifying problems, and tracking resolutions.

Pathway KS Statement: Perform maintenance and customer support functions for interactive media products.

Performance Element: Analyze software technical support needs.

Measurement Criteria: Identify maintenance and support requirements.
Measurement Criteria: Apply information and data analysis techniques.
Measurement Criteria: Define scope of work to meet customer support needs.

Performance Element: Perform customer service.

Measurement Criteria: Provide help to first line user-support personnel to answer user questions.
Measurement Criteria: Provide troubleshooting for interactive media products.
Measurement Criteria: Perform system-tuning function.
Measurement Criteria: Diagnose problems within system.
Measurement Criteria: Perform technical functions required by customer/user.
Measurement Criteria: Communicate and document technical support provided.

Performance Element: Perform product maintenance activities.

Measurement Criteria: Following organizational procedural in communicate and document maintenance tasks.
Measurement Criteria: Identify and analyze problem.
Measurement Criteria: Analyze and propose solutions.
Measurement Criteria: Implement solutions in code and documentation.
Measurement Criteria: Release software and documentation updates according to procedures.
PATHWAY: Programming and Software Development
Pathway Topic: Programming and Software Engineering Pathway

Pathway KS Statement: Identify and analyze customer software needs and requirements.

Performance Element: Gather data to identify customer requirements.
  Measurement Criteria: Gather information using interviewing strategies.
  Measurement Criteria: Identify input and output requirements.
  Measurement Criteria: Identify system processing requirements.
  Measurement Criteria: Clarify specifications using questioning techniques.
  Measurement Criteria: Identify hardware, networking, and software system functional requirements.
  Measurement Criteria: Demonstrate knowledge of nonfunctional requirements (e.g., security, integrity, response time, reliability, support, and documentation).

Performance Element: Conduct needs analysis.
  Measurement Criteria: Gather information on problems from users.
  Measurement Criteria: Perform workflow analysis to determine user needs.
  Measurement Criteria: Analyze existing procedures.
  Measurement Criteria: Define business problem to be solved by the application.

Performance Element: Development software requirements specification.
  Measurement Criteria: Demonstrate knowledge of the use, structure, and contents of a requirements specification document.
  Measurement Criteria: Define system and software requirements.
  Measurement Criteria: Develop informal specifications.
  Measurement Criteria: Develop formal specification.
  Measurement Criteria: Resolve conflicting requirements.
  Measurement Criteria: Review and verify specification with customer.

Performance Element: Analyze requirements/specifications using current approaches.
  Measurement Criteria: Demonstrate knowledge of how to use software methodologies to analyze a real-world problem.
  Measurement Criteria: Identify constraints.
  Measurement Criteria: Demonstrate knowledge of modeling and analyzing functional requirements (e.g., dataflow diagrams, process specifications, and a data dictionary).
  Measurement Criteria: Demonstrate knowledge of modeling and analyzing data requirements (e.g., Jackson diagrams, entity relationship diagrams, and relations).

Performance Element: Use available reference tools as appropriate.
  Measurement Criteria: Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts).

Pathway KS Statement: Produce IT-based strategies and project plan to solve the specific problem.

Performance Element: Define scope of work for the programming project.
Pathway Topic: Programming and Software Engineering Pathway

Measurement Criteria: Define scope of work to meet customer needs.

Measurement Criteria: Demonstrate knowledge of the key functions and subsystems of the software product.

Measurement Criteria: Demonstrate knowledge of software development process and issues.

Measurement Criteria: Demonstrate knowledge of the system life-cycle approach.

Performance Element: Demonstrate knowledge and skills of working in a software development team.

Measurement Criteria: Identify resources and risks.

Measurement Criteria: Demonstrate knowledge of cross-functional team structures and team members’ roles.

Performance Element: Design project plan.

Measurement Criteria: Demonstrate knowledge of project budgeting, scheduling, and control issues related to software development.

Measurement Criteria: Demonstrate knowledge of software development methodology.

Measurement Criteria: Develop implementation plan.

Pathway KS Statement: Define and analyze system and software requirements.

Performance Element: Identify new IT technologies and assess their potential importance and impact in the future.

Measurement Criteria: Identify new technologies relevant to information technology.

Measurement Criteria: Assess the importance of new technologies to future developments.

Measurement Criteria: Identify system processing requirements.

Measurement Criteria: Identify data communication trends and major current issues.

Performance Element: Explain new and emerging classes of software.

Measurement Criteria: Identify new and emerging classes of software.

Measurement Criteria: Determine compatibility of hardware and software.

Performance Element: Understand elements and types of information processing.

Measurement Criteria: Identify the elements of the information processing cycle (i.e., input, process, output, and storage).

Performance Element: Explain measurement techniques for increased productivity due to information systems implementation.

Measurement Criteria: Identify metrics for measurements.

Measurement Criteria: Measure increases in productivity realized by the implementation of information systems.

Measurement Criteria: Identify new and emerging drivers and inhibitors of information technology change.

Pathway KS Statement: Demonstrate the effective use of tools for software development.

Performance Element: Apply tools for developing software applications.

Measurement Criteria: Demonstrate knowledge of software development environment.

Measurement Criteria: Use prototyping techniques.
Pathway Topic: Programming and Software Engineering Pathway

Measurement Criteria: Use appropriate Configuration Management tools.
Measurement Criteria: Use appropriate issues tracking tools.
Measurement Criteria: Demonstrate knowledge of reuse and components.

Performance Element: Apply language specific programming tools/techniques.

Measurement Criteria: Use appropriate development environment for the selected language (e.g., compilers, debuggers, test generation, static analyzer, etc.).
Measurement Criteria: Use user interface development tools.

Performance Element: Demonstrate knowledge of how to use computer-aided software engineering (CASE) tools.

Measurement Criteria: Use appropriate requirement analysis tools.
Measurement Criteria: Use appropriate modeling and analysis tools.
Measurement Criteria: Use requirement tracking tools.
Measurement Criteria: Demonstrate knowledge of software reuse, design pattern, and components.

Pathway KS Statement: Demonstrate knowledge of the software development process.

Performance Element: Demonstrate knowledge of software development methodology.

Measurement Criteria: Demonstrate knowledge of the information system life cycle.
Measurement Criteria: Demonstrate knowledge of system analysis issues related to design, testing, implementation, and maintenance.
Measurement Criteria: Record and analyze process.
Measurement Criteria: Identify the use of program design tools in a software development process.
Measurement Criteria: Identify roles on team members/customers in the software development process.
Measurement Criteria: Identify current information life cycle models.

Pathway KS Statement: Design a software application.

Performance Element: Create design specification for a computer application.

Measurement Criteria: Demonstrate knowledge of the principles of program design (e.g., structured, object oriented, event-driven) to analyze real-world problems.
Measurement Criteria: Perform a logical design.
Measurement Criteria: Document design specification according to defined procedures.
Measurement Criteria: Design system input, output, processing, and interfaces.
Measurement Criteria: Review system design with management and users.
Measurement Criteria: Use current computer-aided software engineering (CASE) tools.

Performance Element: Demonstrate comprehension of the trade-off involved in design choices.

Measurement Criteria:
Pathway Topic: Programming and Software Engineering Pathway

Demonstrate knowledge of the characteristics and the uses of processing (e.g., batch, interactive, event-driven, object-oriented).

Measurement Criteria: Identify basic concepts of algorithm and data structure development.

Measurement Criteria: Demonstrate knowledge of different data types (e.g., numeric, alphanumeric, tables, etc.).

Measurement Criteria: Identify constraints.

Measurement Criteria: Demonstrate knowledge of nonfunctional requirements (e.g., security, integrity, response time, cost, dependability, migration, etc.).

Measurement Criteria: Demonstrate knowledge of modular design concepts.

Measurement Criteria: Demonstrate knowledge of the features, functions, and architectures of client/server computing.

Performance Element: Apply the principles of effective information management, information organization, and information-retrieval skills.

Measurement Criteria: Demonstrate knowledge of database management concepts.

Measurement Criteria: Define the objectives of a client/server application.

Measurement Criteria: Implement online transition processing.

Measurement Criteria: Design static and dynamic online processing systems.

Measurement Criteria: Employ interface techniques.

Performance Element: Demonstrate knowledge of computing/networking hardware and software architecture.

Measurement Criteria: Demonstrate knowledge of how data is stored, organized, managed and retrieve in various computer and network architecture.

Measurement Criteria: Demonstrate knowledge of software architectures for different classes of applications.

Pathway KS Statement: Produce (code) a computer application.

Performance Element: Demonstrate knowledge of programming language concepts.

Measurement Criteria: Demonstrate knowledge of the hardware-software connection.

Measurement Criteria: Demonstrate knowledge of the concepts of data and procedural representation.

Measurement Criteria: Demonstrate knowledge of the basic principles for analyzing a programming languages.

Measurement Criteria: Demonstrate knowledge of the basics of structured, object-oriented, and event-driven programming.

Measurement Criteria: Demonstrate knowledge of how a programming language can support multitasking and exception-handling.

Performance Element: Demonstrate proficiency in developing an application using an appropriate programming language.

Measurement Criteria: Demonstrate knowledge of current key programming languages and the environment they are used in (e.g., C, C++, Visual Basic, Java, RPG, COBOL, Assembler).
Pathway Topic: Programming and Software Engineering Pathway

Measurement Criteria: Translate data structure and program design into code in an appropriate language.

Measurement Criteria: Demonstrate knowledge of key constructs and commands specific to a language.

Performance Element: Understand the range of languages used in software development.

Measurement Criteria: Demonstrate knowledge of the range of languages used in software development.

Performance Element: Demonstrate knowledge of program development methodology.

Measurement Criteria: Demonstrate knowledge of how to resolve program implementation issues (e.g., debugging, documentation, auditing).

Measurement Criteria: Demonstrate knowledge of software development issues (e.g., correctness, reliability, and productivity).

Measurement Criteria: Demonstrate knowledge of code analysis issues related to design, testing, implementation, and maintenance.

Measurement Criteria: Demonstrate knowledge of how to design and implement programs in a top-down manner.

Measurement Criteria: Demonstrate knowledge of how to translate algorithmic and modular design to develop a program.

Measurement Criteria: Demonstrate knowledge of structured/modular programming.

Measurement Criteria: Demonstrate knowledge of how programming control structures are used to verify correctness.

Measurement Criteria: Use code development tools (debugger, integrated development environments).

Performance Element: Demonstrate knowledge of basic software systems implementation.

Measurement Criteria: Use appropriate programming language.

Measurement Criteria: Analyze and prepare logic using program flowchart.

Measurement Criteria: Review design (e.g., peer and/or user walkthrough).

Measurement Criteria: Compile and debug code.

Measurement Criteria: Prepare code documentation.

Measurement Criteria: Prepare unit testing plan.

Measurement Criteria: Conduct unit testing and bug fixes.

Performance Element: Develop software requirements/specifications.

Measurement Criteria: Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, word flowcharts).

Measurement Criteria: Divide design specifications into logical process blocks.

Measurement Criteria: Identify parameters.

Measurement Criteria: Follow specifications or drawings.

Measurement Criteria: Record process (e.g., using flowchart, step-by-step narrative).

Measurement Criteria: Record data.
Pathway Topic: Programming and Software Engineering Pathway

Performance Element: Resolve problems with integration if they occur.
  
  Measurement Criteria: Troubleshoot unexpected results.
  Measurement Criteria: Fix code.

Pathway KS Statement: Demonstrate knowledge of software testing.

Performance Element: Develop test plan.
  
  Measurement Criteria: Define test procedures.
  Measurement Criteria: Analyze requirement and design specifications.
  Measurement Criteria: Development test cases using requirements and design specification.

Performance Element: Perform testing & validation.
  
  Measurement Criteria: Perform integration testing.
  Measurement Criteria: Perform regression testing.
  Measurement Criteria: Help with user-acceptance test.
  Measurement Criteria: Validate user documentation.
  Measurement Criteria: Document discovered errors.

Performance Element: Document test results.
  
  Measurement Criteria: Document errors discovered.
  Measurement Criteria: Perform defect tracking.

Performance Element: Develop software testing audit trails.
  
  Measurement Criteria: Record error correction procedures and actions.

Pathway KS Statement: Perform quality assurance tasks to produce quality products.

Performance Element: Demonstrate knowledge of software quality assurance.
  
  Measurement Criteria: Demonstrate knowledge of Software QA process.
  Measurement Criteria: Demonstrate knowledge of the standards/requirements for Software QA.
  Measurement Criteria: Develop team relationships to support software quality assurance tasks.

Performance Element: Perform software quality assurance tasks to produce a quality software product.
  
  Measurement Criteria: Identify standards and issues related to I/O programming and design of I/O interfaces.
  Measurement Criteria: Use customer satisfaction in determining product characteristics (e.g., cost, user-friendliness).
  Measurement Criteria: Recognize the relationship between dependability, functionality, ease of use, etc.
  Measurement Criteria: Conduct code walkthrough and/or inspection.
  Measurement Criteria: Follow established procedures for testing, identifying problems, and tracking resolutions.

Pathway KS Statement: Perform maintenance and customer support functions.
Pathway Topic: Programming and Software Engineering Pathway

Performance Element: Analyze software technical support needs.

**Measurement Criteria:** Identify maintenance and support requirements.

**Measurement Criteria:** Apply information and data analysis techniques.

**Measurement Criteria:** Define scope of work to meet customer support needs.

Performance Element: Perform customer service.

**Measurement Criteria:** Access needed information using appropriate reference materials.

**Measurement Criteria:** Provide help to first line user-support personnel to answer user questions.

**Measurement Criteria:** Provide troubleshooting for software.

**Measurement Criteria:** Perform system-tuning function.

**Measurement Criteria:** Diagnose problems within system.

**Measurement Criteria:** Perform technical functions required by customer/user.

**Measurement Criteria:** Communicate and document technical support provided.

Performance Element: Perform software maintenance activities.

**Measurement Criteria:** Following organizational procedural in communicate and document maintenance tasks.

**Measurement Criteria:** Identify and analyze problem.

**Measurement Criteria:** Analyze and propose solutions.

**Measurement Criteria:** Implement solutions in code and documentation.

**Measurement Criteria:** Release software and documentation updates according to procedures.