Teacher Preparation Guide
For Use with the
Career Essentials: Assessments

Discover, Develop and Validate Students’ Knowledge and Skill

INTERNETWORKING ASSESSMENT
Introduction to the Career Essentials: Assessments

The Career Essentials: Assessments can help both students and teachers discover students’ occupational strengths. By implementing the Career Essentials: Assessments, students and teachers can collaboratively develop a life-long learning plan to validate and enhance students’ skills and knowledge. Assessment data results are beneficial for students, teachers and administrators in validating student learning, and improving programs and their accountability.

This teacher preparation guide is a tool developed for instructors to help students capitalize on their unique strengths, which can improve individual student performance and provide a clear way forward for student success.

The Career Essentials: Assessments Teacher Preparation Guide provides an easy-to-follow road map to implement the Career Essentials: Assessments. The guide is not meant to be curriculum nor should it replace that which already exists. It provides specific information regarding the Career Essentials: Assessments so teachers can identify existing curriculum areas that may need additional emphasis.

The guide ultimately helps teachers provide students with learning opportunities. Its goal is for students to become comfortable and successful with the Career Essentials: Assessments.

Inside the guide, teachers will find:
- Major content areas of the assessment
- A blueprint of the assessment competency areas
- A checklist of the various competency areas within the assessment
- Access to a trade- or technical-specific online 10-question demo assessment
- Resources used for the assessment development
- Access to an employability skills based, online 10-question practice assessment to help students navigate the assessment system
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What are Career Essentials: Assessments?
Career Essentials: Assessments are online assessments that evaluate technical and employability skills and knowledge. They are the way ahead for the next generation of our American workforce, and they help candidates validate their technical skills and knowledge to potential employers. They also help local instructors demonstrate the value of their programs, while supporting local industries with a pool of potential employees that has been tested by a system they can trust.

Each assessment was developed by a panel of industry, high school and college/postsecondary subject matter experts (SMEs) using national technical standards. Career Essentials: Assessments were created by industry to ensure relevance to entry-level skills, meet Perkins IV accountability requirements and provide certificates to students who achieve industry-defined scores. They ensure your students are workforce ready.

Career Essentials: Assessments incorporate photographs, videos, animations and illustrations to ensure clarity for each technical question. Drag-and-drop and multiple-choice questions appeal to visual and kinesthetic learners and test content knowledge rather than test-taking abilities. Even simple multiple-choice questions are brought to life through pictures and animations.

Assessments are available in more than 40 trade, industrial and technical areas. A rigorous and educationally sound process captures critical competencies, standards and criteria as defined by industry.

Academic core and critical skill areas also exist in each assessment. State-level academic curriculum specialists identified connections to national academic standards.

Each one-hour assessment includes 50 questions. Under the supervision of a proctor, the integrity of each test is ensured by offering multiple unique versions of the assessment, which measure the same core and critical competencies. Even within the same version, questions and answers are displayed in varying orders to prevent test takers from copying others. The Career Essentials: Assessments are designed to be user-friendly and intuitive for students.

Using the Career Essentials: Assessments
Every classroom is unique. You can use the Career Essentials: Assessments in a way that best suits your program and students. The following directions are SkillsUSA’s suggested and preferred method to implement the assessments so that your students gain the most from the results.

The most important step in the Career Essentials: Assessments process is to select the correct assessment for your students. You are key to the selection process. Without your involvement, the wrong assessment may be selected. Assessment titles do not provide enough information for proper selection. Review the various assessment categories that best correspond to your program.

Next, look at each of the assessment titles within the category and the corresponding blueprint. The blueprint will tell you which competencies and subjects are addressed in the assessment.

Cross-walk the various blueprints with your classroom curriculum. The assessment blueprint will show what’s emphasized and how competencies are weighed. Please remember the Career Essentials: Assessments are based on national industry standards, so the assessment may not perfectly align with the existing curriculum. Content may need to be added or emphasized to better prepare students for the Career Essentials: Assessments.
Once you have selected the assessment that best fits your program, administer that Career Essentials: Assessments at the beginning of your students’ final program year. This could be considered a pre-test.

Assessment results are available as soon as your student completes the assessment. The report provides you with a gap analysis to identify your students’ learning needs according to each competency area within the assessment. Dynamic reports compare your students’ performance to the current state and national averages. Reports also enable you to track a student’s progress on an individual basis. The assessment pre-testing results provide you with a benchmark for your students and identify student learning gaps. This data may help you adjust your own curriculum and identify areas that may need more or less emphasis. The data can be shared with students so everyone can focus on learning areas that need improvement during the school year.

Then, at the end of the school year or program semester, administer your specific Career Essentials: Assessments a second time as a post-test.

Use post-test data to improve or adjust curriculum once again for your next program year. This way, curriculum adjustments are made using the student testing data rather than arbitrarily making adjustments.

This pre- and post-test process is a “win-win” situation for the teacher and especially the student! To ensure a quality process, SkillsUSA is ready to help at any time.

Preparing Students for the Career Essentials: Assessments
Provide each student with a copy of their trade-or technical-specific Career Essentials: Assessments Blueprint. Do this at the beginning of your course. Review and discuss the blueprint with your class, providing insight on the assessment weighting and what is emphasized.

Have students discuss how they can assist each other to prepare for the assessment.

Place the Career Essentials: Assessments Blueprint on the classroom wall. The blueprint will help students focus on the appropriate course content areas that align with the assessment. It will also help everyone to be aware of the program’s goals and expectations.

### The Career Essentials: Assessments at a Glance

- Select the correct assessment title. Do not have someone select the assessment for you, as there may be several titles that may relate to your program
- Review the assessment blueprint that best aligns with your existing curriculum
- Identify gaps in your curriculum, and use additional resources to enhance or align the curriculum
- Share the assessment blueprint with the students so everyone is aware of the expectation
- Have your students take the assessment at the beginning of their final program year as a pre-test
- Use pre-test data to identify learning gaps or strengths of individual students or the class
- Remediate the students using the data analysis from pre-test to enhance, emphasize and adjust learning objectives
- Have your students take the assessment a second time (as a post-test) at the end of the program year to determine learning gains/gaps
- Use post-test data to improve or adjust curriculum for your next program year
Administer the Career Essentials: Assessments as a pre-test to identify student gaps. If possible, pre-test your students at the beginning of their final program year to identify learning gaps both individually and as a class. The data will provide an excellent “road map” to prepare students to take the assessment again (post-test) at the end of the program. Using the data, tailor the instruction to better prepare your students.

Use the pre-test data to ascertain problematic learning areas. Have students identify discussion topics based on the various competency areas and their pre-test data results. Exercises, demonstrations and even questions can be developed by the students using their textbooks or other resources listed in this guide.

Assign homework that aligns to the assessment blueprint. Focus on a competency area within the assessment. Using the checksheets in this guide, have students develop questions and potential answers using the resources identified when developing the assessment. Use the questions for class discussion or “quiz bowl” activities.

Have students take the Career Essentials: Assessments trade- or technical-specific online 10-question demo assessment. This could be a homework assignment or done in class 30 days prior to taking the assessment the second time (as a post-test). This not only will provide students with specific sample questions and potential answers, but it will also allow students to experience the online system again and become more familiar with the types of questions they may encounter when taking the actual assessment.

Following the demo assessment, discuss the experience students had. What question(s) did they not understand? Did they have difficulty navigating the online system? This experience will help students be more comfortable and confident when taking the final assessment.

Discuss as a class or individually with students which question(s) were difficult. Facilitate a discussion to glean more information regarding why certain answers were wrong. Offer techniques students can use to better determine correct answers.

**Workplace-Ready Skills**

Through the Career Essentials: Assessments, you have the option for your students to take an Employability Assessment. This assessment tests a student's workplace-ready skills such as communication, teamwork, time management and more. It can be used for any student in any occupational area as a practice test or a separate assessment.

If you use the Employability Assessment as a practice test have students take it in class. Not only can the Employability Assessment help students become familiar with the navigational tools of the assessment system, but it can also measure and make your students aware of another important skill set. It may also help them become comfortable in the testing environment.

See the Career Essentials: Assessments website for more information: [www.careeressentials.org](http://www.careeressentials.org)
The Employability Assessment is not intended to familiarize students with the Internetworking assessment content.

**Please note:** For all Career Essentials: Assessments to be valid, instructors cannot be present in the room where their students will be taking the test. A proctor is required. Proctors can be other instructors, a school administrator or school counselor.
Assessment Competency Areas
Career Essentials: Assessments Internetworking Assessment covers 38 major technical competency areas (unit areas). In the online assessment, these 38 competencies are tested with 50 interactive, multiple-choice items. Each competency area has a different number of items. The chart lists the major technical competency areas and the percentage of the assessment in each one.

Technical Competency Areas for Internetworking

<table>
<thead>
<tr>
<th>Competency</th>
<th>Percentage of Area Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain common networking concepts and terminology</td>
<td>2%</td>
</tr>
<tr>
<td>Install and troubleshoot basic hardware and software required to communicate in a simple network and test for connectivity</td>
<td>4%</td>
</tr>
<tr>
<td>Compare and contrast various types of media used for networking</td>
<td>2%</td>
</tr>
<tr>
<td>Explain the fundamental concepts associated with media access techniques (Ethernet operation, MAC, LLC, CSMA/CD)</td>
<td>4%</td>
</tr>
<tr>
<td>Optimize network design in regard to segmentation, collision domains and broadcast domains</td>
<td>4%</td>
</tr>
<tr>
<td>Implement and correct problems associated with basic IP addressing and subnetting schemes</td>
<td>4%</td>
</tr>
<tr>
<td>Describe fundamental concepts of switching and routing</td>
<td>4%</td>
</tr>
<tr>
<td>Define the Layers of the OSI model</td>
<td>2%</td>
</tr>
<tr>
<td>Describe the importance of a router in a WAN configuration</td>
<td>2%</td>
</tr>
<tr>
<td>Configure a router to multiple networks by using the IOS software</td>
<td>2%</td>
</tr>
<tr>
<td>Log in to a router, record the IOS and running configuration and use troubleshooting commands</td>
<td>2%</td>
</tr>
<tr>
<td>Configure a router by utilizing the CLI</td>
<td>4%</td>
</tr>
<tr>
<td>Discover other devices on the network using the router</td>
<td>4%</td>
</tr>
<tr>
<td>Manage the IOS software</td>
<td>4%</td>
</tr>
<tr>
<td>Configure routing protocols</td>
<td>4%</td>
</tr>
<tr>
<td>Identify and utilize distance vector routing protocols</td>
<td>4%</td>
</tr>
<tr>
<td>Use TCP/IP suite error and control messages to troubleshoot a router</td>
<td>4%</td>
</tr>
<tr>
<td>Use basic show commands to troubleshoot the router</td>
<td>4%</td>
</tr>
<tr>
<td>Identify the intermediate TCP/IP operations and porting</td>
<td>4%</td>
</tr>
<tr>
<td>Identify and utilize Access Control Lists (ACLs) to add security to the network</td>
<td>4%</td>
</tr>
<tr>
<td>Define and use Variable Length Subnet masking (VLSM)</td>
<td>2%</td>
</tr>
<tr>
<td>Describe how RIP Version 2 is incorporated in a routed network</td>
<td>2%</td>
</tr>
<tr>
<td>Understand how to design and implement single-area OSPF</td>
<td>4%</td>
</tr>
<tr>
<td>Describe and implement EIGRP routing protocol</td>
<td>4%</td>
</tr>
<tr>
<td>Understand how switching operates switching concepts</td>
<td>4%</td>
</tr>
<tr>
<td>Understand the use of the access, distribution and core layers in switching and routing</td>
<td>2%</td>
</tr>
<tr>
<td>Understand how to do a complete switch configuration</td>
<td>4%</td>
</tr>
<tr>
<td>Understand how Spanning Tree Protocol has an effect on network design and setup</td>
<td>4%</td>
</tr>
<tr>
<td>Describe how virtual LANs help to control broadcast domains and how this benefits the LAN network</td>
<td>2%</td>
</tr>
</tbody>
</table>
Configure a VLAN-using network design concept 4%
Utilize Virtual Trunking Protocol to set up multiple ports on a router and switch 4%
Demonstrate how to use NAT and PAT to scale IP addresses over a multi-network configuration 4%
Recognize the use of WAN technologies in the configuration of a router and the delivery of data 2%
Understand and configure a secure PPP serial connection 2%
Illustrate ISDN and DDR concepts 2%
Configure a point-to-point and multi-point Frame Relay circuit 2%
Demonstrate best practices of network administration 2%
Provide customer support 2%

Academic Core and Critical Skill Areas
Academic core and critical skill areas also exist in each assessment. The SkillsUSA national technical committee identified that the following academic skills are embedded in the Internet-working training program and assessment:

Math Skills
• Use fractions to solve practical problems
• Use proportions and ratios to solve practical problems
• Use scientific notation
• Solve practical problems involving percents
• Solve single variable algebraic expressions
• Measure angles
• Find surface area and perimeter of two-dimensional objects
• Find volume and surface area of three-dimensional objects
• Make predictions using knowledge of probability

• Make comparisons, predictions, and inferences using graphs and charts
• Organize and describe data using matrixes
• Solve problems using proportions, formulas and functions
• Binary number systems
• Boolean logic functions

Science Skills
• Plan and conduct a scientific investigation
• Describe characteristics of types of matter based on physical and chemical properties
• Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point and color)
• Understand the modern model of atomic structure
• Use knowledge of classification of elements as metals, metalloids and nonmetals
• Describe phases of matter
• Use knowledge of potential and kinetic energy
• Use knowledge of mechanical, chemical and electrical energy
• Use knowledge of heat, light and sound energy
• Use knowledge of sound and technological applications of sound waves
• Use knowledge of the nature and technological applications of light
• Use knowledge of principles of electricity and magnetism
• Use knowledge of static electricity, current electricity and circuits

Language Arts Skills
• Provide information in oral presentations
• Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice
• Demonstrate use of nonverbal communication skills, such as eye contact, posture and gestures using interviewing techniques to gain information
• Demonstrate comprehension of a variety of informational texts
• Understand source, viewpoint and purpose of texts
• Demonstrate knowledge of appropriate reference materials
• Use print, electronic databases and online resources to access information in books and articles
• Demonstrate informational writing

Connections to National Standards
State-level academic curriculum specialists identified the following connections to national academic standards.

Math Standards
• Numbers and operations
• Problem solving
• Reasoning and proof
• Communication
• Connections
• Representation


Science Standards
• Understands the sources and properties of energy
• Understands forces and motion
• Understands the nature of scientific inquiry

Source: McREL compendium of national science standards. To view and search the compendium, visit: www2.mcrel.org/compendium/.

Language Arts Standards
• Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
• Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
• Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
• Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.readwritethink.org/standards/index.html.
**Student Tools:**

**Access Directions for the Trade- or Technical-Specific Online 10-Item Demo Assessment**

Have your students copy and paste this link [www.careeressentials.org/assessments/demo-our-assessments/](http://www.careeressentials.org/assessments/demo-our-assessments/) into their browser. The sample programmatic questions will give you and your students an idea of the types of questions on the assessment and how the questions are generally written.

**Student Tools:**

**Test-Taking Reminders**

Encourage your students to have good study habits. Below are basic reminders to better prepare students for life-long learning and workplace success. You may want to have this discussion at the beginning of the year to encourage students to incorporate these strategies.

- Develop a regular study schedule
- Identify a specific location to study
- Always take notes while studying in class or on your own
- Take short breaks during your study session
- Perform “mini-testing” to make sure you understand and comprehend the program concepts
- Join small study groups to help focus on the program content
- If you need special assistance in testing, tell your teacher or counselor so they can make accommodations.

**Student Testing Tips**

The most important tip for your students is to be prepared mentally and physically for the testing session. Make sure to tell them to get plenty of rest and eat healthy. Suggest they wear comfortable and appropriate clothing to the testing session. If they are able to bring items to the testing session, such as a non-programmable calculator, make sure they have the items ready the night before. Have students check our website at [www.careeressentials.org/wp-content/uploads/2017/07/Permitted-Testing-Tools-Aids.pdf](http://www.careeressentials.org/wp-content/uploads/2017/07/Permitted-Testing-Tools-Aids.pdf) for permitted tools or job aids that can be used during testing. The more organized they are before the testing period, the more relaxed they will be during the actual testing session.

Encourage your students to be relaxed and positive. If they begin to panic during the testing, suggest they take some deep breaths to relax and think positive thoughts.

Do not rush through the questions. Instruct your students to read the question and potential answers thoroughly. Tell them to make sure they know exactly what the question is asking before answering. Let them know that if they are unsure, they can mark the question and return to it. Other questions may have clues to the correct answer.

Use process of elimination. If your students are not sure of the correct answer, tell them to study the potential answers and eliminate the ones that they know are not correct.

If all else fails, tell students to guess. After they have exhausted all options, tell them to take their best guess at the correct answer. If they have studied the content area, they may intuitively know the correct answer. The Career Essentials: Assessments system does not penalize students for guessing and they may guess correctly!

**Student Tools:**

**Internetworking Blueprint and Competency Area Knowledge Checksheets**

The next section provides the assessment blueprint and detailed topics within each competency area covered within the Internetworking assessment. Photocopy and share the following blueprints and checksheets with your students so they can better prepare for each of the competency areas within the Internetworking assessment.
Summary and Quick Glance Testing

Reminders

The Career Essentials: Assessments process is designed for program and curriculum improvement. This is a continuous improvement process to better meet the educational needs of your students by strategically using data results.

Advanced planning and preparation is a key component in implementing this process. Below we have attempted to summarize the steps in the suggested Career Essentials: Assessments implementation pre- and post-test process.

- Identify the correct assessment for your program
- Share the selected assessment blueprint with your students, parents, advisory board members and others. Place the blueprint on the classroom wall
- Pre-test your students at the beginning of their final programmatic year
- Use the data results to identify “learning gaps”
- Share the pre-test data with the student(s)
- Tailor learning experiences to meet student needs and supplement current curriculum
- Develop homework assignments around the competency knowledge checksheets located in this guide
- Have students take the demo 10-question practice test 30 days prior to the post-test
- For students that need more time in the actual testing environment, use the Employability Assessment to review navigational tools and to make students more comfortable in the testing lab
- Finally, review the blueprint and knowledge checksheets in totality before taking the post-test to ensure students are aware of the expectation

Using the above steps, you and your students should see improvement in the post-test assessment score report and a percentage of knowledge gained.
Internetworking Blueprint

This Blueprint contains the subject matter content of this Career Essentials Assessment. 

Note: To fully prepare for Internetworking SkillsUSA Championships contest, refer to the current year’s SkillsUSA Championships Technical Standard, now included with your SkillsUSA Professional Membership. If you need help in accessing this benefit, contact the SkillsUSA Membership Office at 1-800-355-8422.

Standards and Competencies

Competencies are weighted throughout the assessment. The percent shown is the weight of the competency. There are 50 questions for this assessment.

Explain common networking concepts and terminology

- Identify the basic characteristics of LANs and WANs
- Explain the concept of bandwidth and throughput and factors that affect them
- List and describe the components necessary to create a small LAN using wire or wireless media
- Identify the roles of various network devices in a network (NICs, hubs, switches, routers, firewalls, AP)
- Explain the concept of latency and how it can be minimized
- Describe the advantages and disadvantages associated with implementing common physical topologies: star/extended star, ring and mesh
- Explain the importance of implementing basic security in computer networks

Install and troubleshoot basic hardware and software required to communicate in a simple network and test for connectivity

- Identify the pin-outs and construct a UTP (patch, console and crossover) cable for connectivity
- Specify the cable type required for the various Ethernet connections
- Configure a host with the appropriate addressing parameters to connect to a network
- Verify and troubleshoot basic connectivity using various testing tools, utilities and commands (cable testers, ping, trace, IP configuration, etc.)
- Document the physical and logical aspects of network topology
- Determine and install the appropriate network cabling and media required for connectivity between devices
- Configure, connect, verify and troubleshoot issues with the operation of an Ethernet NIC
- Determine the physical issues associated with cabling network equipment working over a WAN link

Compare and contrast various types of media used for networking

- Explain the characteristics and benefits of copper cable, fiber and wireless network media (air) in network applications, including data transmission speeds
- Identify the basic characteristics of UTP and fiber cables
- Identify Ethernet cabling issues that can cause degraded service
- Explain practical factors that cause attenuation of data signals over the different network media types (copper, fiber, air [radio frequency], and identify possible solutions to a media problem
- Identify basic concerns of implementing faster Ethernet

Explain the fundamental concepts associated with media access techniques (Ethernet operation, MAC, LLC, CSMA/CD)
Describe the differences between full duplex and half duplex transmissions
  - Describe media access considerations of each
Explain the function of auto negotiation of speed and duplex
Describe the function of the Data Link Layer as it applies to Ethernet, including MAC and LLC sublayers
Explain the concept of broadcast media and the addressing of a layer 2 broadcast on an Ethernet media
Describe and discuss CSMA/CD, including the process, listen, send, collision, jam and back off

Optimize network design in regard to segmentation, collision domains and broadcast domains
- Describe basic operation of hubs and repeaters as they apply to Ethernet
- Explain how collisions are detected and managed in Ethernet networks
- Explain the concepts of collision domains and network segmentation
- Explain the benefits of using a switch versus using a hub in an Ethernet network
- Explain how collisions and excessive broadcasts occur in networks
  - Identify devices used to minimize collision and excessive broadcast effects

Implement and correct problems associated with basic IP addressing and subnetting schemes
- Explain the purpose of an IP address, subnet mask and a default gateway
  - Identify the appropriate address required for internetwork communication between hosts
- Categorize the different IP v4 address classes and their identifying features
- Explain the advantages and disadvantages of using public and private IP v4 addresses
- Determine whether an IP address is a network, broadcast, subnet, public or private IP v4 address
- Determine the appropriate subnet mask and IP addressing scheme required to meet network requirements for scalability and functionality
- Identify the methods for a node to obtain an IP address (include static and dynamic methods)
- Correct common problems associated with implementing basic IP addressing schemes in a network environment

Describe fundamental concepts of switching and routing
- Explain the major functions of a switch
- Explain the major functions of a router
- Explain the basic use of routed and routing protocols in network
- Describe the forwarding of frames and packets in switched and routed networks
- Describe the characteristics and functions of IP (connectionless and unreliable)
- Compare the basic concepts of static and dynamic routing
- Explain the OSI model and its functionality in computer networking

Define the Layers of the OSI model
- Explain the benefits of using the OSI model as a conceptual framework for network communication
- Explain the process of encapsulation and identify the protocol data units associated with each OSI Layer model
- Identify and describe the functions of network devices at each layer of the OSI model
- Explain ARP and when it is used
- Compare and contrast connection and connectionless delivery of packets in a network
- Describe the primary functions of the transport layer
Compare and contrast characteristics of TCP and UDP
Identify and describe the major TCP/IP protocols used at each layer of the OSI model
Identify basic issues that occur at each layer using the OSI model
  - Identify the fields in the headers of protocol data units
  - Describe their role in propagating data in a network (MAC address, IP address, TCP port number)

Describe the importance of a router in a WAN configuration
- Compare WAN connections to LAN connections
- Identify the role of a router in a WAN
- Describe the importance of a WAN router
- Describe router physical characteristics
- Connect all router external connections, management, LAN and WAN

Configure a router to multiple networks by using the IOS software
- Identify the workings of an operating system works with the router
- Determine the state of the router interfaces using the LED indicators
- Identify the features of the IOS for services that will be delivered on the network

Log in to a router, record the IOS and running configuration and use troubleshooting commands
- Describe the boot process
- Log in and navigate throughout the router IOS
- Fix errors by utilizing troubleshooting command line errors
- View the image names and memory of the router by using the show version command 6

Configure a router by utilizing the CLI
- Utilize CLI command modes
- Configure a router name
- Configure router passwords
- Utilize the show commands
- Configure a serial interface and Ethernet interface
- Change configurations
- Configure interface descriptions
- Configure interface description
- Configure login banners and MOTD
- Configure host tables
- Back up the configuration file by using the copy command to back up the configuration file
Discover other devices on the network using the router
∞ Document neighboring routers and Cisco devices by using Cisco Discovery Protocol (CDP) commands
∞ Monitor CDP
∞ Disable CDP
∞ Troubleshoot CDP
∞ Gather information about remote devices by using Telnet
∞ Establish and verify a Telnet connection
∞ Disconnect and suspend Telnet sessions
∞ Use advanced Telnet operation
∞ Troubleshoot IP address issues

Manage the IOS software
∞ Identify where a Cisco device locates and loads IOS
∞ Utilize the boot system command
∞ Configure the register
∞ Troubleshoot IOS boot failure
∞ Manage the Cisco file system
∞ Identify IOS naming conventions
∞ Utilize TFTP to manage and copy

Configure routing protocols
∞ Identify the workings of a static route
∞ Configure static routes
∞ Configure default route forwarding
∞ Verify static route configuration
∞ Troubleshoot static route configuration
∞ Identify the purpose of a routing protocol and autonomous system
∞ Identify the classes of routing protocols
∞ Identify distance vector routing protocol features and examples
∞ Discuss link-state routing protocol features and examples
∞ Describe path determination
∞ Configure RIP and OSPF single area

Identify and utilize distance vector routing protocols
∞ View distance vector routing updates, hold-down timers, and RIP processes
∞ Eliminate routing loops through split horizon, route poisoning, triggered updates
∞ Utilize RIP as the routing protocol
∞ Configure RIP
∞ Utilize the IP classless command
∞ Verify RIP configuration
∞ Troubleshoot RIP update issues
∞ Load balance using RIP
∞ Load balance across multiple paths
∞ Integrate static routes with RIP
Use TCP/IP suite error and control messages to troubleshoot a router

- Identify TCP/IP error message
- Utilize ICMP
- Utilize ICMP message delivery
- Discover unreachable networks
- Utilize ping to test destination reach ability
- Define echo messages
- Utilize the TCP/IP suite control messages
- Utilize ICMP redirect/change request
- Utilize requests and reply message formats
- Utilize congestion and flow control message

Use basic show commands to troubleshoot the router

- Utilize the show IP route command to determine the gateway of last resort, route source and destination, L2 and L3 addresses, administrative distance, route metric, the route next hop, last route update and multiple paths to destination
- Identify OSI layers
- Troubleshoot Layer 1 using show interface
- Troubleshoot Layer 2 using show interface
- Troubleshoot using show CDP
- Troubleshoot using trace route
- Troubleshoot routing issues
- Troubleshoot using show controllers serial
- Utilize the debug command

Identify the intermediate TCP/IP operations and porting

- Identify synchronization process or three-way handshake
- Define a denial-of-service attack
- Identify how windowing, sequencing numbers and positive ACK work together to deliver data packets
- Compare UDP with TCP
- Observe transport layer ports
- Test multiple conversations between hosts
- Define ports for services, clients and numbering and well known port numbers
- Compare and contrast MAC addresses, IP addresses and port numbers

Identify and utilize Access Control Lists (ACLs) to add security to the network

- Describe access control list fundamentals
- Create ACLs
- Discuss the function of a wildcard mask
- Utilize an ACL by Verify
- Compare standard, extended ACLs and named ACLs
- Place an ACL to create the requested security inside a firewall

Define and use Variable Length Subnet masking (VLSM)

- Define VLSM and why is it used
- Recognize when to use VLSM
- Calculate subnets with VLSM
- Recognize route aggregation with VLSM
- Configure VLSM on a multi-router network
Describe how RIP Version 2 is incorporated in a routed network

- Compare RIP v1 and v2
- Configure RIP v2
- Verify RIP v2
- Troubleshoot RIP v2

Understand how to design and implement single-area OSPF

- Recognize link-state routing protocol
- Compare the advantages and disadvantages of link-state routing
- Compare and contrast distance vector and link-state routing
- Compare OSPF with distance vector routing protocols
- Observe single area OSPF configuration
- Configure the OSPF routing process
- Configure OSPF loopback address and router priority
- Modify OSPF cost metric
- Configure OSPF authentication
- Configure OSPF timers
- Verify the OSPF configuration
- Troubleshoot OSPF configuration

Describe and implement EIGRP routing protocol

- Recognize EIGRP concepts
- Describe EIGRP concepts and terminology
- Configure EIGRP
- Configure EIGRP summarization
- Verify basic EIGRP
- Troubleshoot EIGRP configuration

Understand how switching operates switching concepts

- Recognize Ethernet/802.3 LAN technologies
- Recognize factors that impact network performance
- Recognize network segmentation using hardware devices
- Recognize basic operations of a switch
- Compare Layer 2 and Layer 3 switching
- Compare symmetric and asymmetric switching
- Recognize micro segmentation implementation
- Recognize the effects switches have on a collision domain

Understand the use of the access, distribution and core layers in switching and routing

- Describe LAN design goals
- Utilize a 1,2,3 layered model in the switch design

Understand how to do a complete switch configuration

- Verify port LEDs during switch POST
- View initial boot output from the switch
- Examine keyboard help in the switch CLI
- Recognize switch modes
- Configure the switch
- Verify the catalyst switch default configuration
Configure the catalyst switch
Manage the MAC address table
Configure static MAC addresses
Configure port security
Execute a plan for adds, moves and changes
Manage switch operating system
Define password recover
Recognize firmware upgrade

Understand how Spanning Tree Protocol has an effect on network design and setup
- Describe redundant topologies
- Describe a broadcast storm
- Recognize redundant topology and spanning tree
- Describe spanning tree operations
- Design the configuration to select a root bridge
- Select the stages of spanning tree port states
- Describe spanning tree recalculation and its effects on the network

Describe how virtual LANs help to control broadcast domains and how this benefits the LAN network
- Recognize VLAN concepts
- Demonstrate the relationship between broadcast domains with VLANs and routers
- Describe VLAN types

Configure a VLAN-using network design concept
- Define geographic VLANs
- Configure static VLANs
- Verify VLAN configuration
- Save VLAN configuration
- Delete VLANs
- Troubleshoot VLANs

Utilize Virtual Trunking Protocol to set up multiple ports on a router and switch
- Describe Trunking concepts
- Describe Trunking operation
- Describe VTP concepts and how to configure and implement them in a physical and logical network design
- Divide physical interfaces into sub-interfaces
- Configure inter-VLAN routing

Demonstrate how to use NAT and PAT to scale IP addresses over a multi-network configuration
- Name the private address spaces
- Identify the features of NAT and PAT
- Configure NAT and PAT
- Verify PAT configuration
- Troubleshoot NAT and PAT configurations
- Identify and utilize DHCP in a router configuration
- Verify DHCP operation
- Troubleshoot DHCP
Recognize the use of WAN technologies in the configuration of a router and the delivery of data

- Name the WAN devices
- Identify WAN standards and encapsulation types
- Compare packet and circuit switching
- Name the WAN link options and technology related to them
- Incorporate WAN design into the network scheme
- Know how to identify and select networking capabilities
- Use a three-layer design model

Understand and configure a secure PPP serial connection

- Define a serial point-to-point links
- Define time-division multiplexing
- Use demarcation point as a reference for security
- Define DTE-DCE
- Compare HDLC encapsulation to PPP
- Configure PPP authentication
- Compare password authentication Protocol (PAP) to challenge handshake authentication protocol
- Configure PPP
- Verify the serial PPP encapsulation configuration
- Troubleshoot the serial PPP encapsulation configuration

Illustrate ISDN and DDR concepts

- Discuss ISDN standards and access methods
- Name the ISDN switch types
- Configure ISDN BRI/PRI ports
- Verify ISDN configuration
- Troubleshoot the ISDN configuration
- Configure legacy DDR
- Define static routes for DDR
- Configure DDR dialer information
- Set up a dialer profile
- Configure dialer profiles
- Verify DDR configuration
- Troubleshoot the DDR configuration

Configure a point-to-point and multi-point Frame Relay circuit

- Describe frame relay concepts
- Define frame relay terminology
- Configure a basic frame relay
- Configure a static frame relay map
- Configure frame relay sub-interfaces
- Verify the frame relay configuration
- Troubleshoot the frame relay configuration

Demonstrate best practices of network administration

- Define and compare workstations and servers
- Define NOS
- Use popular network operating systems Microsoft XP, 2000, NET, UNIX Sun, HP and LINUX versions as they relate to a network
- Describe SNMP and CMIP standards
- Configure SNMP and use syslogs to monitor networks
Provide customer support

- Converse effectively and correctly with a customer
- Speak clearly and to the point when conversing about products and solutions for the customer
- Repeat name, location and phone number back to the customer during technical support conversations
- Record all conversations with customers as either information, need to know or solution delivered
- Make good comparisons that the customer can relate to when troubleshooting a problem
- Take the needed actions to fix the customer’s problem
- Close the conversation with a positive, reassuring attitude

Committee Identified Academic Skills
The SkillsUSA national technical committee has identified that the following academic skills are embedded in the internetworking training program and assessment:

Math Skills
- Use fractions to solve practical problems
- Use proportions and ratios to solve practical problems
- Use scientific notation
- Solve practical problems involving percents
- Solve single variable algebraic expressions
- Measure angles
- Find surface area and perimeter of two-dimensional objects
- Find volume and surface area of three-dimensional objects
- Make predictions using knowledge of probability
- Make comparisons, predictions, and inferences using graphs and charts
- Organize and describe data using matrices
- Solve problems using proportions, formulas and functions
- Binary number systems
- Boolean logic functions

Science Skills
- Plan and conduct a scientific investigation
- Describe characteristics of types of matter based on physical and chemical properties
- Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point and color)
- Understand the modern model of atomic structure
- Use knowledge of classification of elements as metals, metalloids and nonmetals
- Describe phases of matter
- Use knowledge of potential and kinetic energy
- Use knowledge of mechanical, chemical and electrical energy
- Use knowledge of heat, light and sound energy
- Use knowledge of sound and technological applications of sound waves
- Use knowledge of the nature and technological applications of light
- Use knowledge of principles of electricity and magnetism
- Use knowledge of static electricity, current electricity and circuits

Language Arts Skills
- Provide information in oral presentations
- Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice
- Demonstrate use of nonverbal communication skills, such as eye contact, posture and gestures using interviewing techniques to gain information
• Demonstrate comprehension of a variety of informational texts
• Understand source, viewpoint and purpose of texts
• Demonstrate knowledge of appropriate reference materials
• Use print, electronic databases and online resources to access information in books and articles
• Demonstrate informational writing

Connections to National Standards
State-level academic curriculum specialists identified the following connections to national academic standards.

Math Standards
• Numbers and operations
• Problem solving
• Reasoning and proof
• Communication
• Connections
• Representation


Science Standards
• Understands the sources and properties of energy
• Understands forces and motion
• Understands the nature of scientific inquiry

Source: McREL compendium of national science standards. To view and search the compendium, visit: www.mcrel.org/standards-benchmarks/.

Language Arts Standards
• Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
• Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes
• Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
• Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information)

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.readwritethink.org/standards/index.html.
Competency Area 1: Explain common networking concepts and terminology

Knowledge Check

How well do you know how to:

1. Identify the basic characteristics of LANs and WANS?

2. Explain the concept of bandwidth and throughput and factors that affect them?

3. List and describe the components necessary to create a small LAN using wire or wireless media?

4. Identify the roles of various network devices in a network (NICs, hubs, switches, routers, firewalls, AP)?

5. Explain the concept of latency and how it can be minimized?

6. Describe the advantages and disadvantages associated with implementing common physical topologies: star/extended star, ring and mesh?

7. Explain the importance of implementing basic security in computer networks?

Areas I Need To Review:
Review Dates

Competency Area 2: Install and troubleshoot basic hardware and software required to communicate in a simple network and test for connectivity

Knowledge Check

How well do you know how to:

1. Identify the pin-outs and construct a UTP (patch, console and crossover) cable for connectivity?
   - Very Well
   - Somewhat Well
   - Not Well
2. Specify the cable type required for the various Ethernet connections?
   - Very Well
   - Somewhat Well
   - Not Well
3. Configure a host with the appropriate addressing parameters to connect to a network?
   - Very Well
   - Somewhat Well
   - Not Well
4. Verify and troubleshoot basic connectivity using various testing tools, utilities and commands (cable testers, ping, trace, IP configuration, etc.)?
   - Very Well
   - Somewhat Well
   - Not Well
5. Document the physical and logical aspects of network topology?
   - Very Well
   - Somewhat Well
   - Not Well
6. Determine and install the appropriate network cabling and media required for connectivity between devices?
   - Very Well
   - Somewhat Well
   - Not Well
7. Configure, connect, verify and troubleshoot issues with the operation of an Ethernet NIC?
   - Very Well
   - Somewhat Well
   - Not Well
8. Determine the physical issues associated with cabling network equipment working over a WAN link?
   - Very Well
   - Somewhat Well
   - Not Well

Areas I Need To Review:
**Competency Area 3: Compare and contrast various types of media used for networking**

**Knowledge Check**

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explain the characteristics and benefits of copper cable, fiber and wireless network media (air) in network applications, including data transmission speeds?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>2. Identify the basic characteristics of UTP and fiber cables?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>3. Identify Ethernet cabling issues that can cause degraded service?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>4. Explain practical factors that cause attenuation of data signals over the different network media types (copper, fiber, air i.e.: radio frequency), and identify possible solutions to a media problem?</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>5. Identify basic concerns of implementing faster Ethernet?</td>
<td>[ ]</td>
<td>[ ]</td>
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</tr>
</tbody>
</table>

Areas I Need To Review:
Competency Area 4: Explain the fundamental concepts associated with media access techniques (Ethernet operation, MAC, LLC, CSMA/CD)

Knowledge Check

How well do you know how to:

1. Describe the differences between full duplex and half duplex transmissions?
   - Very Well □
   - Somewhat Well □
   - Not Well □

2. Describe media access considerations of each?
   - Very Well □
   - Somewhat Well □
   - Not Well □

3. Explain the function of auto negotiation of speed and duplex?
   - Very Well □
   - Somewhat Well □
   - Not Well □

4. Describe the function of the Data Link Layer as it applies to Ethernet, including MAC and LLC sub-layers?
   - Very Well □
   - Somewhat Well □
   - Not Well □

5. Explain the concept of broadcast media and the addressing of a layer 2 broadcast on an Ethernet media?
   - Very Well □
   - Somewhat Well □
   - Not Well □

6. Describe and discuss CSMA/CD, including the process, listen, send, collision, jam and back off?
   - Very Well □
   - Somewhat Well □
   - Not Well □

Areas I Need To Review:
Competency Area 5: Optimize network design in regard to segmentation, collision domains and broadcast domains

Knowledge Check

How well do you know how to:  
1. Describe basic operation of hubs and repeaters as they apply to Ethernet?  
   - Very Well  
   - Somewhat Well  
   - Not Well

2. Explain how collisions are detected and managed in Ethernet networks?  
   - Very Well  
   - Somewhat Well  
   - Not Well

3. Explain the concepts of collision domains and network segmentation?  
   - Very Well  
   - Somewhat Well  
   - Not Well

4. Explain the benefits of using a switch versus using a hub in an Ethernet network?  
   - Very Well  
   - Somewhat Well  
   - Not Well

5. Explain how collisions and excessive broadcasts occur in networks?  
   - Very Well  
   - Somewhat Well  
   - Not Well

6. Identify devices used to minimize collision and excessive broadcast effects  
   - Very Well  
   - Somewhat Well  
   - Not Well

Areas I Need To Review:
**Competency Area 6: Implement and correct problems associated with basic IP addressing and sub netting schemes**

**Knowledge Check**

How well do you know how to:

1. Explain the purpose of an IP address, subnet mask and a default gateway?  
   Very Well ☐  Somewhat Well ☐  Not Well ☐

2. Identify the appropriate address required for internetwork communication between hosts?  
   Very Well ☐  Somewhat Well ☐  Not Well ☐

3. Categorize the different IP v4 address classes and their identifying features?  
   Very Well ☐  Somewhat Well ☐  Not Well ☐

4. Explain the advantages and disadvantages of using public and private IP v4 addresses?  
   Very Well ☐  Somewhat Well ☐  Not Well ☐

5. Determine whether an IP address is a network, broadcast, subnet, public or private IP v4 address?  
   Very Well ☐  Somewhat Well ☐  Not Well ☐

6. Determine the appropriate subnet mask and IP addressing scheme required to meet network requirements for scalability and functionality?  
   Very Well ☐  Somewhat Well ☐  Not Well ☐

7. Identify the methods for a node to obtain an IP address (include static and dynamic methods)?  
   Very Well ☐  Somewhat Well ☐  Not Well ☐

8. Correct common problems associated with implementing basic IP addressing schemes in a network environment?  
   Very Well ☐  Somewhat Well ☐  Not Well ☐

**Areas I Need To Review:**
## Competency Area 7: Describe fundamental concepts of switching and routing

### Knowledge Check

How well do you know how to:

<table>
<thead>
<tr>
<th>Question</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explain the major functions of a switch?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Explain the major functions of a router?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Explain the basic use of routed and routing protocols in network?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Describe the forwarding of frames and packets in switched and routed networks?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Describe the characteristics and functions of IP (connectionless and unreliable)?</td>
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<td></td>
</tr>
<tr>
<td>6. Compare the basic concepts of static and dynamic routing?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Explain the OSI model and its functionality in computer networking?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Areas I Need To Review:
Competency Area 8: Define the Layers of the OSI model

Knowledge Check

How well do you know how to:

1. Explain the benefits of using the OSI model as a conceptual framework for network communication?

2. Explain the process of encapsulation and identify the protocol data units associated with each OSI Layer model?

3. Identify and describe the functions of network devices at each layer of the OSI model?

4. Explain ARP and when it is used?

5. Compare and contrast connection and connectionless delivery of packets in a network?

6. Describe the primary functions of the transport layer?

7. Compare and contrast characteristics of TCP and UDP?

8. Identify and describe the major TCP/IP protocols used at each layer of the OSI model?

9. Identify basic issues that occur at each layer using the OSI model?

10. Identify the fields in the headers of protocol data units?

11. Describe their role in propagating data in a network (MAC address, IP address, TCP port number)?

Areas I Need To Review:
Competency Area 9: Describe the importance of a router in a WAN configuration

Knowledge Check

How well do you know how to:

1. Compare WAN connections to LAN connections?  
   - Very Well  
   - Somewhat Well  
   - Not Well

2. Identify the role of a router in a WAN?  
   -  
   -  
   -  

3. Describe the importance of a WAN router?  
   -  
   -  
   -  

4. Describe router physical characteristics?  
   -  
   -  
   -  

5. Connect all router external connections, management, LAN and WAN?  
   -  
   -  
   -  

Areas I Need To Review:
## Competency Area 10: Configure a router to multiple networks by using the IOS software

### Knowledge Check

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify the workings of an operating system works with the router?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Determine the state of the router interfaces using the LED indicators?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Identify the features of the IOS for services that will be delivered on the network?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

### Areas I Need To Review:
Competency Area 11: Log in to a router, record the IOS and running configuration and use troubleshooting commands

Knowledge Check

How well do you know how to: 

1. Describe the boot process? 

2. Log in and navigate throughout the router IOS? 

3. Fix errors by utilizing troubleshooting command line errors? 

4. View the image names and memory of the router by using the show version command 6? 

Areas I Need To Review:
Competency Area 12: Configure a router by utilizing the CLI

Knowledge Check

How well do you know how to:

1. Utilize the CLI command modes?

2. Configure a router name?

3. Configure router passwords?

4. Utilize the show commands?

5. Configure a serial interface and Ethernet interface?

6. Change configurations?

7. Configure interface description(s)?

8. Configure login banners and MOTD?

9. Configure host tables?

10. Back up the configuration file by using the copy command to back up the configuration file?

Areas I Need To Review:
**Competency Area 13: Discover other devices on the network using the router**

**Knowledge Check**

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Document neighboring routers and Cisco devices by using Cisco Discovery Protocol (CDP) commands?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Monitor CDP?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Disable CDP?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Troubleshoot CDP?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Gather information about remote devices by using Telnet?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Establish and verify a Telnet connection?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Disconnect and suspend Telnet sessions?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Use advanced Telnet operation?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. Troubleshoot IP address issues?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Areas I Need To Review:**
Competency Area 14: Manage the IOS software

Knowledge Check

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify where a Cisco device locates and loads IOS?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Utilize the boot system command?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Configure the register?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Troubleshoot IOS boot failure?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Manage the Cisco file system?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Identify IOS naming conventions?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Utilize TFTP to manage and copy?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Areas I Need To Review:
Competency Area 15: Configure routing protocols

Knowledge Check

How well do you know how to:

1. Identify the workings of a static route?
   - Very Well
   - Somewhat Well
   - Not Well

2. Configure static routes?
   - Very Well
   - Somewhat Well
   - Not Well

3. Configure default route forwarding?
   - Very Well
   - Somewhat Well
   - Not Well

4. Verify static route configuration?
   - Very Well
   - Somewhat Well
   - Not Well

5. Troubleshoot static route configuration?
   - Very Well
   - Somewhat Well
   - Not Well

6. Identify the purpose of a routing protocol and autonomous system?
   - Very Well
   - Somewhat Well
   - Not Well

7. Identify the classes of routing protocols?
   - Very Well
   - Somewhat Well
   - Not Well

8. Identify distance vector routing protocol features and examples?
   - Very Well
   - Somewhat Well
   - Not Well

9. Discuss link-state routing protocol features and examples?
   - Very Well
   - Somewhat Well
   - Not Well

10. Describe path determination?
    - Very Well
    - Somewhat Well
    - Not Well

11. Configure RIP and OSPF single area?
    - Very Well
    - Somewhat Well
    - Not Well

Areas I Need To Review:
Competency Area 16: Identify and utilize distance vector routing protocols

Knowledge Check

How well do you know how to:

1. View distance vector routing updates, hold-down timers, and RIP processes?
   - Very Well
   - Somewhat Well
   - Not Well

2. Eliminate routing loops through split horizon, route poisoning, triggered updates?
   - Very Well
   - Somewhat Well
   - Not Well

3. Utilize RIP as the routing protocol?
   - Very Well
   - Somewhat Well
   - Not Well

4. Configure RIP?
   - Very Well
   - Somewhat Well
   - Not Well

5. Utilize the IP classless command?
   - Very Well
   - Somewhat Well
   - Not Well

6. Verify RIP configuration?
   - Very Well
   - Somewhat Well
   - Not Well

7. Troubleshoot RIP update issues?
   - Very Well
   - Somewhat Well
   - Not Well

8. Load balance using RIP?
   - Very Well
   - Somewhat Well
   - Not Well

9. Load balance across multiple paths?
   - Very Well
   - Somewhat Well
   - Not Well

10. Integrate static routes with RIP?
    - Very Well
    - Somewhat Well
    - Not Well

Areas I Need To Review:
## Competency Area 17: Use TCP/IP suite error and control messages to troubleshoot a router

### Knowledge Check

How well do you know how to:

<table>
<thead>
<tr>
<th>Task</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify TCP/IP error message?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Utilize ICMP?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Utilize ICMP message delivery?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Discover unreachable networks?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Utilize ping to test destination reach ability?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Define echo messages?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Utilize the TCP/IP suite control messages?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Utilize ICMP redirect/change request?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Utilize requests and reply message formats?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Utilize congestion and flow control message?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Areas I Need To Review:
Competency Area 18: Use basic show commands to troubleshoot the router

Knowledge Check

How well do you know how to:

1. Utilize the show IP route command to determine the gateway of last resort, route source and destination, L2 and L3 addresses, administrative distance, route metric, the route next hop, last route update and multiple paths to destination? [ ] Very Well [ ] Somewhat Well [ ] Not Well

2. Identify OSI layers? [ ] Very Well [ ] Somewhat Well [ ] Not Well

3. Troubleshoot Layer 1 using show interface? [ ] Very Well [ ] Somewhat Well [ ] Not Well

4. Troubleshoot Layer 2 using show interface? [ ] Very Well [ ] Somewhat Well [ ] Not Well

5. Troubleshoot using show CDP? [ ] Very Well [ ] Somewhat Well [ ] Not Well

6. Troubleshoot using trace route? [ ] Very Well [ ] Somewhat Well [ ] Not Well

7. Troubleshoot routing issues? [ ] Very Well [ ] Somewhat Well [ ] Not Well

8. Troubleshoot using show controllers serial? [ ] Very Well [ ] Somewhat Well [ ] Not Well

9. Utilize the debug command? [ ] Very Well [ ] Somewhat Well [ ] Not Well

Areas I Need To Review:
### Competency Area 19: Identify the intermediate TCP/IP operations and porting

#### Knowledge Check

How well do you know how to:

<table>
<thead>
<tr>
<th></th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify synchronization process or three-way handshake?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Define a denial-of-service attack?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Identify how windowing, sequencing numbers and positive ACK work together to deliver data packets?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Compare UDP with TCP?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Observe transport layer ports?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Test multiple conversations between hosts?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Define ports for services, clients and numbering and well known port numbers?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Compare and contrast MAC addresses, IP addresses and port numbers?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Areas I Need To Review:
Competency Area 20: Identify and utilize Access Controls Lists (ACLs) to add security to the network

Knowledge Check

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe access control list fundamentals?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Create ACLs?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Discuss the function of a wildcard mask?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Utilize an ACL by Verify?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Compare standard, extended ACLs and named ACLs?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Place an ACL to create the requested security inside a firewall?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Areas I Need To Review:
**Competency Area 21: Define and use Variable Length Subnet masking (VLSM)**

**Knowledge Check**

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Define VLSM and why is it used?</td>
<td>❑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Recognize when to use VLSM?</td>
<td>❑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Calculate subnets with VLSM?</td>
<td>❑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Recognize route aggregation with VLSM?</td>
<td>❑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Configure VLSM on a multi-router network?</td>
<td>❑</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Areas I Need To Review:**
Competency Area 22: Describe how RIP Version 2 is incorporated in a routed network

Knowledge Check

How well do you know how to:

1. Compare RIP v1 and v2? Very Well □ Somewhat Well □ Not Well □
2. Configure RIP v2? □ □ □
3. Verify RIP v2? □ □ □
4. Troubleshoot RIP v2? □ □ □

Areas I Need To Review:
## Competency Area 23: Understand how to design and implement single-area OSPF

### Knowledge Check

How well do you know how to:

<table>
<thead>
<tr>
<th></th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recognize link-state routing protocol?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Compare the advantages and disadvantages of link-state routing?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Compare and contrast distance vector and link-state routing?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Compare OSPF with distance vector routing protocols?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Observe single area OSPF configuration?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Configure the OSPF routing process?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Configure OSPF loopback address and router priority?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Modify OSPF cost metric?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. Configure OSPF authentication?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. Configure OSPF timers?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11. Verify the OSPF configuration?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12. Troubleshoot OSPF configuration?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

### Areas I Need To Review:
**Competency Area 24: Describe and implement EIGRP routing protocol**

**Knowledge Check**

How well do you know how to:

<table>
<thead>
<tr>
<th></th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recognize EIGRP concepts?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Describe EIGRP concepts and terminology?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Configure EIGRP?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Configure EIGRP summarization?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Verify basic EIGRP?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Troubleshoot EIGRP configuration?</td>
<td>☐</td>
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</tr>
</tbody>
</table>

**Areas I Need To Review:**
Review Dates:

Competency Area 25: Understand how switching operates switching concepts

Knowledge Check

How well do you know how to:

1. Recognize Ethernet/802.3 LAN technologies?  
   Very Well ☐  Somewhat Well ☐  Not Well ☐

2. Recognize factors that impact network performance?  
   ☐  ☐  ☐

3. Recognize network segmentation using hardware devices?  
   ☐  ☐  ☐

4. Recognize basic operations of a switch?  
   ☐  ☐  ☐

5. Compare Layer 2 and Layer 3 switching?  
   ☐  ☐  ☐

6. Compare symmetric and asymmetric switching?  
   ☐  ☐  ☐

7. Recognize micro segmentation implementation?  
   ☐  ☐  ☐

8. Recognize the effects switches have on a collision domain?  
   ☐  ☐  ☐

Areas I Need To Review:
Competency Area 26: Understand the use of the access, distribution and core layers in switching and routing

Knowledge Check

How well do you know how to:

1. Describe LAN design goals?   
   Very Well: ☐  Somewhat Well: ☐  Not Well: ☐

2. Utilize a 1, 2, 3 layered model in the switch design?   
   ☐  ☐  ☐

Areas I Need To Review:
## Competency Area 27: Understand how to do a complete switch configuration

### Knowledge Check

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verify port LEDs during switch POST?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. View initial boot output from the switch?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3. Examine keyboard help in the switch CLI?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Recognize switch modes?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Configure the switch?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Verify the catalyst switch default configuration?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Configure the catalyst switch?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Manage the MAC address table?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Configure static MAC addresses?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Configure port security?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Execute a plan for adds, moves and changes?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Manage switch operating system?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Define password recover?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Recognize firmware upgrade?</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Areas I Need To Review:
**Competency Area 28: Understand how Spanning Tree Protocol has an effect on network design and setup**

**Knowledge Check**

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe redundant topologies?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Describe a broadcast storm?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Recognize redundant topology and spanning tree?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. Describe spanning tree operations?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Design the configuration to select a root bridge?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. Select the stages of spanning tree port states?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. Describe spanning tree recalculation and its effects on the network?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Areas I Need To Review:
Competency Area 29: Describe how virtual LANs help to control broadcast domains and how this benefits the LAN network

Knowledge Check

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recognize VLAN concepts?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. Demonstrate the relationship between broadcast domains with VLANs and routers?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Describe VLAN types?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Areas I Need To Review:
Competency Area 30: Configure a VLAN-using network design concept

Knowledge Check

How well do you know how to:

1. Define geographic VLANs?
   - Very Well
   - Somewhat Well
   - Not Well

2. Configure static VLANs?
   - Very Well
   - Somewhat Well
   - Not Well

3. Verify VLAN configuration?
   - Very Well
   - Somewhat Well
   - Not Well

4. Save VLAN configuration?
   - Very Well
   - Somewhat Well
   - Not Well

5. Delete VLANs?
   - Very Well
   - Somewhat Well
   - Not Well

6. Troubleshoot VLANs?
   - Very Well
   - Somewhat Well
   - Not Well

Areas I Need To Review:
Competency Area 31: Utilize Virtual Trunking Protocol to set up multiple ports on a router and switch

Knowledge Check

How well do you know how to:
1. Describe Trunking concepts? □ □ □
2. Describe Trunking operation? □ □ □
3. Describe VTP concepts and how to configure and implement them in a physical and logical network design? □ □ □
4. Divide physical interfaces into sub-interfaces? □ □ □
5. Configure inter-VLAN routing? □ □ □

Areas I Need To Review:
**Competency Area 32: Demonstrate how to use NAT and PAT to scale IP addresses over a multi-network configuration**

**Knowledge Check**

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Name the private address spaces?</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>2. Identify the features of NAT and PAT?</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. Configure NAT and PAT?</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>4. Verify PAT configuration?</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. Troubleshoot NAT and PAT configurations?</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>6. Identify and utilize DHCP in a router configuration?</td>
<td>☐</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>7. Verify DHCP operation?</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. Troubleshoot DHCP?</td>
<td>☐</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Areas I Need To Review:**
Review Dates:

Competency Area 33: Recognize the use of WAN technologies in the configuration of a router and the delivery of data

Knowledge Check

How well do you know how to:

1. Name the WAN devices? ☐ ☐ ☐

2. Identify WAN standards and encapsulation types? ☐ ☐ ☐

3. Compare packet and circuit switching? ☐ ☐ ☐

4. Name the WAN link options and technology related to them? ☐ ☐ ☐

5. Incorporate WAN design into the network scheme? ☐ ☐ ☐

6. Know how to identify and select networking capabilities? ☐ ☐ ☐

7. Use a three-layer design model? ☐ ☐ ☐

Areas I Need To Review:
Competency Area 34: Understand and configure a secure PPP serial connection

Knowledge Check

How well do you know how to:

1. Define a serial point-to-point links?

2. Define time-division multiplexing?

3. Use demarcation point as a reference for security?

4. Define DTE-DCE?

5. Compare HDLC encapsulation to PPP?

6. Configure PPP authentication?

7. Compare password authentication Protocol (PAP) to challenge handshake authentication protocol?

8. Configure PPP?

9. Verify the serial PPP encapsulation configuration?

10. Troubleshoot the serial PPP encapsulation configuration?

Areas I Need To Review:
Competency Area 35: Illustrate ISDN and DDR concepts

Knowledge Check

How well do you know how to:

1. Discuss ISDN standards and access methods?  Very Well  Somewhat Well  Not Well
2. Name the ISDN switch types?  
3. Configure ISDN BRI/PRI ports?  
4. Verify ISDN configuration?  
5. Troubleshoot the ISDN configuration?  
6. Configure legacy DDR?  
7. Define static routes for DDR?  
8. Configure DDR dialer information?  
9. Set up a dialer profile?  
10. Configure dialer profiles?  
11. Verify DDR configuration?  
12. Troubleshoot the DDR configuration?  

Areas I Need To Review:
Competency Area 36: Configure a point-to-point and multi-point Frame Relay circuit

Knowledge Check

<table>
<thead>
<tr>
<th>How well do you know how to:</th>
<th>Very Well</th>
<th>Somewhat Well</th>
<th>Not Well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe frame relay concepts?</td>
<td>□</td>
<td></td>
<td>□</td>
</tr>
<tr>
<td>2. Define frame relay terminology?</td>
<td>□</td>
<td></td>
<td>□</td>
</tr>
<tr>
<td>3. Configure a basic frame relay?</td>
<td>□</td>
<td></td>
<td>□</td>
</tr>
<tr>
<td>4. Configure a static frame relay map?</td>
<td>□</td>
<td></td>
<td>□</td>
</tr>
<tr>
<td>5. Configure frame relay sub-interfaces?</td>
<td>□</td>
<td></td>
<td>□</td>
</tr>
<tr>
<td>6. Verify the frame relay configuration?</td>
<td>□</td>
<td></td>
<td>□</td>
</tr>
<tr>
<td>7. Troubleshoot the frame relay configuration?</td>
<td>□</td>
<td></td>
<td>□</td>
</tr>
</tbody>
</table>

Areas I Need To Review:
Competency Area 37: Demonstrate best practices of network administration

Knowledge Check

How well do you know how to:

1. Define and compare workstations and servers?  
   - Very Well  - Somewhat Well  - Not Well

2. Define NOS?
   - Very Well  - Somewhat Well  - Not Well

3. Use popular network operating systems Microsoft XP, 2000, NET, UNIX Sun, HP and LINUX versions as they relate to a network?
   - Very Well  - Somewhat Well  - Not Well

4. Describe SNMP and CMIP standards?
   - Very Well  - Somewhat Well  - Not Well

5. Configure SNMP and use syslog to monitor networks?
   - Very Well  - Somewhat Well  - Not Well

Areas I Need To Review:
Competency Area 38: Provide customer support

Knowledge Check

How well do you know how to:

1. Converse effectively and correctly with a customer? 
   - Very Well: 
   - Somewhat Well: 
   - Not Well: 

2. Speak clearly and to the point when conversing about products and solutions for the customer? 
   - Very Well: 
   - Somewhat Well: 
   - Not Well: 

3. Repeat name, location and phone number back to the customer during technical support conversations? 
   - Very Well: 
   - Somewhat Well: 
   - Not Well: 

4. Record all conversations with customers as either information, need to know or solution delivered? 
   - Very Well: 
   - Somewhat Well: 
   - Not Well: 

5. Make good comparisons that the customer can relate to when troubleshooting a problem? 
   - Very Well: 
   - Somewhat Well: 
   - Not Well: 

6. Take the needed actions to fix the customer's problem? 
   - Very Well: 
   - Somewhat Well: 
   - Not Well: 

7. Close the conversation with a positive, reassuring attitude? 
   - Very Well: 
   - Somewhat Well: 
   - Not Well: 

Areas I Need To Review:
Access Directions to the Trade- or Technical-Specific Online 10-question Demo Assessment
Access the Web link www.careeressentials.org/assessments/demo-our-assessments/ with your browser. The sample programmatic questions will help give you an idea of the types of questions on the assessment and how they are generally written.

Test-Taking Reminders
Implementing good study habits is essential for any test or class. Below are basic reminders to better prepare you for life-long learning and workplace success. Incorporate these strategies into your everyday habits.
• Develop a regular study schedule
• Identify a specific location to study
• Always take notes while studying in class or on your own
• Take short breaks during your study session
• Perform “mini-testing” to make sure you understand and comprehend the program concepts
• Join small study groups to help focus on the program content
• If you need special assistance in testing, tell your teacher or counselor so he or she can make accommodations

Student Testing Tips
The most important tip for you is to be prepared mentally and physically for the testing session. Make sure to get plenty of rest and eat healthy. Wear comfortable and appropriate clothing to the testing session. Find out if you can bring items to the testing session, such as a non-programmable calculator, and make sure you have the items ready the night before. Check the website at www.careeressentials.org/wp-content/uploads/2017/07/Permitted-Testing-Tools-Aids.pdf for permitted tools or job aids that can be used during testing. The more organized you are before the testing period, the more relaxed you will be during the actual testing session.

Be relaxed and positive. If you begin to panic during the testing, take some deep breaths to relax, and think positive thoughts.

Do not rush through the questions. Read the question and potential answers thoroughly. Make sure you know exactly what the question is asking before answering. If you are unsure, note the question and return to it. Other questions may have clues to the correct answer. Use process of elimination. If you are not sure of the correct answer, study the potential answers and eliminate the ones that you know are not correct.

If all else fails – guess. After you have exhausted all options, take your best guess at the correct answer. If you have studied the content area, you may intuitively know the correct answer. The Career Essentials: Assessments does not penalize you for guessing, and you may guess correctly!
Sample Assessment Questions

Sample Questions
The following questions are examples of the types of questions you may see within the assessment test. The questions could be in the form of a video clip, drop and drag, sequential or a typical multiple choice.

Internetworking Test Questions

1) Where would the router obtain its operating system given the following registry setting: 0x0101?

A. EPROM  
B. NVRAM  
C. FLASH  
D. TFTP server

Answer A

2) Which command would give you the information about the 2950 switch displayed in the image shown?

```
Device ID: leesburg-sw1
Entry address(es):
Platform: cisco 2950, capabilities: Switch
Interface: FastEthernet0/0, Port ID (outgoing port): FastEthernet0/1
Holdtime: 147

Version:
cisco internetwork operating system software
IOS (tm) C2950 Software (C2950-I5042-M), Version 12.1(22)EA4, RELEASE SOFTWARE(F11)
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 18-May-05 09:31 by jharrib
advertisement version: 2
Duplex: full
```

A. Router1#sh cdp ne de  
B. Router1#sh cdp ne  
C. Router1#sh cdp neighbor  
D. Router1(config)#sh cdp ne

Answer: A
3) What was not configured on the PC in the image shown?

A. IP Address
B. Subnet Mask
C. Default Gateway
D. DNS Servers

Answer: D

4) Which of the following class networks corresponds with the IP number 127.0.0.0/12?

A. Class A
B. Class B
C. Class C
D. Class D

Answer: B
5) Which statement describes non-deterministic MAC protocols?

A. Hosts are arranged in a logical ring topology.
B. Computers only transmit when they possess a token.
C. Hosts take turns transmitting data.
D. NICs listen for the absence of a signal before transmitting.

Answer: D

6) When a router is being connected to an ISP with the use of a DSU/CSU, the router is the DTE and the DSU/CSU is the DCE. What is a key difference between DCE and DTE devices?

A. The router always has higher priority when the routers and the DSU/CSU communicate.
B. The DCE device provides the clockrate for synchronous serial communication.
C. The router is always managed by an ISP or regulatory agency, and the DSU/CSU is managed by the administrator.
D. The DSU/CSU cable cannot be connected to an S0/1 interface if S0/0 is available.

Answer: B
Additional Resources
Below are resources that will be helpful in preparing for the Assessments which were created based on industry standards nationwide. Use the Career Essentials: Assessments Blueprint as a guideline for competencies tested. Use the resources below to find curriculum or additional study guides for industry standards.

Internetworking Resources:
www.careeressentials.org/assessments/assessment-resources/