CompTIA A+ Core 1 (220-1101)

1.0 Mobile Devices

1.1 Given a scenario, install and configure laptop hardware and components.

Objectives	Primary Module
• Hardware/device replacement	Supporting Processors and Upgrading Memory
• Battery	Taking a Computer Apart and Putting It Back Together
• Keyboard/keys	Supporting I/O Devices
• Random-access memory (RAM)	Supporting Processors and Upgrading Memory
• Hard disk drive (HDD)/solid-state drive (SSD) migration	Hard Drives and Other Storage Devices

Objectives	Primary Module
• HDD/SSD replacement	Hard Drives and Other Storage Devices
• Wireless cards	Supporting I/O Devices
• Physical privacy and security components	Supporting Mobile Devices
• Biometrics	Supporting Mobile Devices
• Near-field scanner features	Supporting Mobile Devices

1.2 Compare and contrast the display components of mobile devices.

Objectives	Primary Module
• Types	Supporting I/O Devices
• Liquid crystal display (LCD)	Supporting I/O Devices
• In-plane switching (IPS)	Supporting I/O Devices
• Twisted nematic (TN)	Supporting I/O Devices

Objectives	Primary Module
• Vertical alignment (VA)	Supporting I/O Devices
• Organic light-emitting diode (OLED)	Supporting I/O Devices
• Mobile display components	Supporting I/O Devices
• WiFi antenna connector/placement	Supporting I/O Devices
• Camera/webcam	Supporting I/O Devices
• Microphone	Supporting I/O Devices
• Touch screen/digitizer	Supporting I/O Devices
• Inverter	Supporting I/O Devices

1.3 Given a scenario, set up and configure accessories and ports of mobile devices.

Objectives	Primary Module
• Connection methods	Supporting Mobile Devices

Objectives	Primary Module
• Universal Serial Bus (USB)/USB-C/microUSB/miniUSB	Supporting Mobile Devices
• Lightning	Supporting Mobile Devices
• Serial interfaces	Supporting Mobile Devices
• Near-field communication (NFC)	Supporting Mobile Devices
• Bluetooth	Supporting Mobile Devices
• Hotspot	Supporting Mobile Devices
• Accessories	Supporting Mobile Devices
• Touch pens	Supporting Mobile Devices
• Headsets	Supporting Mobile Devices
• Speakers	Supporting Mobile Devices
• Webcam	Supporting Mobile Devices

Objectives	Primary Module
• Docking station	Taking a Computer Apart and Putting It Back Together
• Port replicator	Taking a Computer Apart and Putting It Back Together
• Trackpad/drawing pad	Taking a Computer Apart and Putting It Back Together

1.4 Given a scenario, configure basic mobile-device network connectivity and application support.

Objectives	Primary Module
• Wireless/cellular data network (enable/disable)	Supporting Mobile Devices
• 2G/3G/4G/5G	Supporting Mobile Devices
• Hotspot	Supporting Mobile Devices
• Global System for Mobile Communications (GSM) vs. code-division multiple access (CDMA)	Supporting Mobile Devices

Objectives	Primary Module
• Preferred Roaming List (PRL) updates	Supporting Mobile Devices
• Bluetooth	Supporting Mobile Devices
• Enable Bluetooth	Supporting Mobile Devices
• Enable pairing	Supporting Mobile Devices
• Find a device for pairing	Supporting Mobile Devices
• Enter the appropriate PIN code	Supporting Mobile Devices
• Test connectivity	Supporting Mobile Devices
• Location services	Supporting Mobile Devices
• Global Positioning System (GPS) services	Supporting Mobile Devices
• Cellular location services	Supporting Mobile Devices
• Mobile device management (MDM)/mobile application management (MAM)	Supporting Mobile Devices

Objectives	Primary Module
• Corporate email configuration	Supporting Mobile Devices
• Two-factor authentication	Supporting Mobile Devices
• Corporate applications	Supporting Mobile Devices
• Mobile device synchronization	Supporting Mobile Devices
• Account setup	Supporting Mobile Devices
• Microsoft 365	Supporting Mobile Devices
• Google Workspace	Supporting Mobile Devices
• iCloud	Supporting Mobile Devices
• Data to synchronize	Supporting Mobile Devices
• Mail	Supporting Mobile Devices
• Photos	Supporting Mobile Devices

Objectives	Primary Module
• Calendar	Supporting Mobile Devices
• Contacts	Supporting Mobile Devices
• Recognizing data caps	Supporting Mobile Devices

2.0 Networking

2.1 Compare and Contrast Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) Ports, Protocols, and Their Purposes.

Objectives	Primary Module
• Ports and protocols	Networking Fundamentals
• 20/21 – File Transfer Protocol (FTP)	Networking Fundamentals
• 22 – Secure Shell (SSH)	Networking Fundamentals
• 23 – Telnet	Networking Fundamentals
• 25 – Simple Mail Transfer Protocol (SMTP)	Networking Fundamentals

Objectives	Primary Module
• 53 – Domain Name System (DNS)	Networking Fundamentals
• 67/68 – Dynamic Host Configuration Protocol (DHCP)	Networking Fundamentals
• 80 – Hypertext Transfer Protocol (HTTP)	Networking Fundamentals
• 110 – Post Office Protocol 3 (POP3)	Networking Fundamentals
• 137/139 – Network Basic Input/Output System (NetBIOS)/ NetBIOS over TCP/IP (NetBT)	Networking Fundamentals
• 143 – Internet Mail Access Protocol (IMAP)	Networking Fundamentals
• 161/162 – Simple Network Management Protocol (SNMP)	Networking Fundamentals
• 389 – Lightweight Directory Access Protocol (LDAP)	Networking Fundamentals
• 443 – Hypertext Transfer Protocol Secure (HTTPS)	Networking Fundamentals
• 445 – Server Message Block (SMB)/Common Internet	Networking Fundamentals

Objectives	Primary Module
File System (CIFS)	
• 3389 – Remote Desktop Protocol (RDP)	Networking Fundamentals
• TCP vs. UDP	Networking Fundamentals
• Connectionless	Networking Fundamentals
• DHCP	Networking Fundamentals
• Trivia File Transfer Protocol (TFTP)	Networking Fundamentals
• Connection-oriented	Networking Fundamentals
• HTTPS	Networking Fundamentals
• SSH	Networking Fundamentals

2.2 Compare and contrast common networking hardware.

Objectives	Primary Module
• Routers	Networking Fundamentals

Objectives	Primary Module
• Switches	Networking Fundamentals
• Managed	Network Infrastructure and Cloud Computing
• Unmanaged	Network Infrastructure and Cloud Computing
• Access points	Network Infrastructure and Cloud Computing
• Patch panel	Network Infrastructure and Cloud Computing
• Firewall	Network Infrastructure and Cloud Computing
• Power over Ethernet (PoE)	Network Infrastructure and Cloud Computing
• Injectors	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• Switch	Network Infrastructure and Cloud Computing
• PoE standards	Network Infrastructure and Cloud Computing
• Hub	Networking Fundamentals
• Cable modem	Networking Fundamentals
• Digital subscriber line (DSL)	Network Infrastructure and Cloud Computing
• Optical network terminal (ONT)	Network Infrastructure and Cloud Computing
• Network interface card (NIC)	Networking Fundamentals
• Software-defined networking (SDN)	Network Infrastructure and Cloud Computing

2.3 Compare and contrast protocols for wireless networking.

Objectives	Primary Module
• Frequencies	Network Infrastructure and Cloud Computing
• 2.4GHz	Network Infrastructure and Cloud Computing
• 5GHz	Network Infrastructure and Cloud Computing
• Channels	Network Infrastructure and Cloud Computing
• Regulations	Network Infrastructure and Cloud Computing
• 2.4GHz vs. 5GHz	Network Infrastructure and Cloud Computing
• Bluetooth	Supporting Mobile Devices
• 802.11	Network Infrastructure and Cloud Computing
• a	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• b	Network Infrastructure and Cloud Computing
• g	Network Infrastructure and Cloud Computing
• n	Network Infrastructure and Cloud Computing
• ac (WiFi 5)	Network Infrastructure and Cloud Computing
• ax (WiFi 6)	Network Infrastructure and Cloud Computing
• Long-range fixed wireless	Network Infrastructure and Cloud Computing
• Licensed	Network Infrastructure and Cloud Computing
• Unlicensed	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• Power	Network Infrastructure and Cloud Computing
• Regulatory requirements for wireless power	Network Infrastructure and Cloud Computing
• NFC	Supporting Mobile Devices
• Radio-frequency identification (RFID)	Supporting Mobile Devices

2.4 Summarize services provided by networked hosts.

Objectives	Primary Module
• Server roles	Networking Fundamentals
• DNS	Networking Fundamentals
• DHCP	Networking Fundamentals
• Fileshare	Networking Fundamentals
• Print servers	Networking Fundamentals

Objectives	Primary Module
• Mail servers	Networking Fundamentals
• Syslog	Networking Fundamentals
• Web servers	Networking Fundamentals
• Authentication, authorization, and accounting (AAA)	Networking Fundamentals
• Internet appliances	Network Infrastructure and Cloud Computing
• Spam gateways	Network Infrastructure and Cloud Computing
• Unified threat management (UTM)	Network Infrastructure and Cloud Computing
• Load balancers	Network Infrastructure and Cloud Computing
• Proxy servers	Networking Fundamentals

Objectives	Primary Module
• Legacy/embedded systems	Network Infrastructure and Cloud Computing
• Supervisory control and data acquisition (SCADA)	Network Infrastructure and Cloud Computing
• Internet of Things (IoT) devices	Network Infrastructure and Cloud Computing

2.5 Given a scenario, install and configure basic wired/wireless small office/home office (SOHO) networks.

Objectives	Primary Module
• Internet Protocol (IP) addressing	Networking Fundamentals
• IPv4	Networking Fundamentals
• Private addresses	Networking Fundamentals
• Public addresses	Networking Fundamentals

Objectives	Primary Module
• IPv6	Networking Fundamentals
• Automatic Private IP Addressing (APIPA)	Networking Fundamentals
• Static	Networking Fundamentals
• Dynamic	Networking Fundamentals
• Gateway	Networking Fundamentals

2.6 Compare and contrast common network configuration concepts.

Objectives	Primary Module
• DNS	Networking Fundamentals
• Address (A)	Networking Fundamentals
• Address (AAAA)	Networking Fundamentals
• Mail exchanger (MX)	Networking Fundamentals

Objectives	Primary Module
• Text (TXT)	Networking Fundamentals
• Spam management	Networking Fundamentals
(i) DomainKeys Identified Mail (DKIM)	Networking Fundamentals
(ii) Sender Policy Framework (SPF)	Networking Fundamentals
(iii) Domain-based Message Authentication, Reporting, and Conformance (DMARC)	Networking Fundamentals
• DHCP	Networking Fundamentals
• Leases	Networking Fundamentals
• Reservations	Networking Fundamentals
• Scope	Networking Fundamentals
• Virtual LAN (VLAN)	Network Infrastructure and Cloud Computing
• Virtual private network (VPN)	Network Infrastructure and Cloud Computing

Objectives	Primary Module

2.7 Compare and Contrast Internet Connection Types, Network Types, and Their Features.

Objectives	Primary Module
• Internet connection types	Network Infrastructure and Cloud Computing
• Satellite	Network Infrastructure and Cloud Computing
• Fiber	Network Infrastructure and Cloud Computing
• Cable	Network Infrastructure and Cloud Computing
• DSL	Network Infrastructure and Cloud Computing
• Cellular	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• Wireless Internet service provider (WISP)	Network Infrastructure and Cloud Computing
• Network types	Network Infrastructure and Cloud Computing
• Local area network (LAN)	Network Infrastructure and Cloud Computing
• Wide area network (WAN)	Network Infrastructure and Cloud Computing
• Personal area network (PAN)	Network Infrastructure and Cloud Computing
• Metropolitan area network (MAN)	Network Infrastructure and Cloud Computing
• Storage area network (SAN)	Network Infrastructure and Cloud Computing
• Wireless local area network (WLAN)	Network Infrastructure and Cloud Computing

2.8 Given a scenario, use networking tools.

Objectives	Primary Module
• Crimper	Network Infrastructure and Cloud Computing
• Cable stripper	Network Infrastructure and Cloud Computing
• WiFi analyzer	Network Infrastructure and Cloud Computing
• Toner probe	Network Infrastructure and Cloud Computing
• Punchdown tool	Network Infrastructure and Cloud Computing
• Cable tester	Network Infrastructure and Cloud Computing
• Loopback plug	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• Network tap	Network Infrastructure and Cloud Computing

3.0 Hardware

3.1 Explain Basic Cable Types and Their Connectors, Features, and Purposes.

Objectives	Primary Module
• Network cables	Network Infrastructure and Cloud Computing
• Copper	Network Infrastructure and Cloud Computing
• Cat 5	Network Infrastructure and Cloud Computing
• Cat 5e	Network Infrastructure and Cloud Computing
• Cat 6	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• Cat 6a	Network Infrastructure and Cloud Computing
• Coaxial	Network Infrastructure and Cloud Computing
• Shielded twisted pair	Network Infrastructure and Cloud Computing
(i) Direct burial	Network Infrastructure and Cloud Computing
• Unshielded twisted pair	Network Infrastructure and Cloud Computing
• Plenum	Network Infrastructure and Cloud Computing
• Optical	Network Infrastructure and Cloud Computing
• Fiber	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• T568A/T568B	Network Infrastructure and Cloud Computing
• Peripheral cables	Supporting I/O Devices
• USB 2.0	Supporting I/O Devices
• USB 3.0	Supporting I/O Devices
• Serial	Supporting I/O Devices
• Thunderbolt	Supporting I/O Devices
• Video cables	Supporting I/O Devices
• High-Definition Multimedia Interface (HDMI)	Supporting I/O Devices
• DisplayPort	Supporting I/O Devices
• Digital Visual Interface (DVI)	Supporting I/O Devices
• Video Graphics Array (VGA)	Supporting I/O Devices

Objectives	Primary Module
• Hard drive cables	Hard Drives and Other Storage Devices
• Serial Advanced Technology Attachment (SATA)	Hard Drives and Other Storage Devices
• Small Computer System Interface (SCSI)	Hard Drives and Other Storage Devices
• External SATA (eSATA)	Hard Drives and Other Storage Devices
• Integrated Drive Electronics (IDE)	Hard Drives and Other Storage Devices
• Adapters	Supporting I/O Devices
• Connector types	
• RJ11	Network Infrastructure and Cloud Computing
• RJ45	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• F type	Network Infrastructure and Cloud Computing
• Straight tip (ST)	Network Infrastructure and Cloud Computing
• Subscriber connector (SC)	Network Infrastructure and Cloud Computing
• Lucent connector (LC)	Network Infrastructure and Cloud Computing
• Punchdown block	Network Infrastructure and Cloud Computing
• microUSB	Supporting I/O Devices
• miniUSB	Supporting I/O Devices
• USB-C	Supporting I/O Devices
• Molex	All About Motherboards
• Lightning port	Supporting I/O Devices

Objectives	Primary Module
• DB9	Supporting I/O Devices

3.2 Given a scenario, install the appropriate RAM.

Objectives	Primary Module
• RAM types	Supporting Processors and Upgrading Memory
• Virtual RAM	Supporting Processors and Upgrading Memory
• Small outline dual inline memory module (SODIMM)	Supporting Processors and Upgrading Memory
• Double Data Rate 3 (DDR3)	Supporting Processors and Upgrading Memory
• Double Data Rate 4 (DDR4)	Supporting Processors and Upgrading Memory
• Double Data Rate 5 (DDR5)	Supporting Processors and Upgrading Memory

Objectives	Primary Module
• Error correction code (ECC) RAM	Supporting Processors and Upgrading Memory
• Single-channel	Supporting Processors and Upgrading Memory
• Dual-channel	Supporting Processors and Upgrading Memory
• Triple-channel	Supporting Processors and Upgrading Memory
• Quad-channel	Supporting Processors and Upgrading Memory

3.3 Given a scenario, select and install storage devices.

Objectives	Primary Module
• Hard drives	Hard Drives and Other Storage Devices
• Speeds	Hard Drives and Other Storage Devices

Objectives	Primary Module
• 5,400rpm	Hard Drives and Other Storage Devices
• 7,200rpm	Hard Drives and Other Storage Devices
• 10,000rpm	Hard Drives and Other Storage Devices
• 15,000rpm	Hard Drives and Other Storage Devices
• Form factor	Hard Drives and Other Storage Devices
• 2.5	Hard Drives and Other Storage Devices
• 3.5	Hard Drives and Other Storage Devices
• SSDs	Hard Drives and Other Storage Devices

Objectives	Primary Module
• Communications interfaces	Hard Drives and Other Storage Devices
• Non-volatile Memory Express (NVMe)	Hard Drives and Other Storage Devices
• SATA	Hard Drives and Other Storage Devices
• Peripheral Component Interconnect Express (PCIe)	Hard Drives and Other Storage Devices
• Form factors	Hard Drives and Other Storage Devices
• M.2	Hard Drives and Other Storage Devices
• mSATA	Hard Drives and Other Storage Devices
• Drive configurations	Hard Drives and Other Storage Devices

Objectives	Primary Module
• Redundant Array of Independent (or Inexpensive) Disks (RAID) 0, 1, 5, 10	Hard Drives and Other Storage Devices
• Removable storage	Hard Drives and Other Storage Devices
• Flash drives	Hard Drives and Other Storage Devices
• Memory cards	Hard Drives and Other Storage Devices
• Optical drives	Hard Drives and Other Storage Devices

3.4 Given a scenario, install and configure motherboards, central processing units (CPUs), and add-on cards.

Objectives	Primary Module
• Motherboard form factor	All About Motherboards
• Advanced Technology eXtended (ATX)	All About Motherboards

Objectives	Primary Module
• Information Technology eXtended (ITX)	All About Motherboards
• Motherboard connector types	All About Motherboards
• Peripheral Component Interconnect (PCI)	All About Motherboards
• PCI Express (PCIe)	All About Motherboards
• Power connectors	All About Motherboards
• SATA	All About Motherboards
• eSATA	All About Motherboards
• Headers	All About Motherboards
• M.2	All About Motherboards
• Motherboard compatibility	Supporting Processors and Upgrading Memory

Objectives	Primary Module
• CPU sockets	Supporting Processors and Upgrading Memory
• Advanced Micro Devices, Inc. (AMD)	Supporting Processors and Upgrading Memory
• Intel	Supporting Processors and Upgrading Memory
• Server	Supporting Processors and Upgrading Memory
• Multisocket	Supporting Processors and Upgrading Memory
• Desktop	All About Motherboards
• Mobile	All About Motherboards
• Basic Input/Output System (BIOS)/Unified Extensible Firmware Interface (UEFI) settings	All About Motherboards
• Boot options	All About Motherboards

Objectives	Primary Module
• USB permissions	All About Motherboards
• Trusted Platform Module (TPM) security features	All About Motherboards
• Fan considerations	All About Motherboards
• Secure Boot	All About Motherboards
• Boot password	All About Motherboards
• Encryption	All About Motherboards
• TPM	All About Motherboards
• Hardware security module (HSM)	All About Motherboards
• CPU architecture	Supporting Processors and Upgrading Memory
• x64/x86	Supporting Processors and Upgrading Memory

Objectives	Primary Module
• Advanced RISC Machine (ARM)	Supporting Processors and Upgrading Memory
• Single-core	Supporting Processors and Upgrading Memory
• Multicore	Supporting Processors and Upgrading Memory
• Multithreading	Supporting Processors and Upgrading Memory
• Virtualization support	Supporting Processors and Upgrading Memory
• Expansion cards	Supporting I/O Devices
• Sound card	Supporting I/O Devices
• Video card	Supporting I/O Devices
• Capture card	Supporting I/O Devices
• NIC	Supporting I/O Devices

Objectives	Primary Module
• Cooling	Power Supplies and Troubleshooting Computer Problems
• Fans	Power Supplies and Troubleshooting Computer Problems
• Heat sink	Power Supplies and Troubleshooting Computer Problems
• Thermal paste/pads	Power Supplies and Troubleshooting Computer Problems
• Liquid	Power Supplies and Troubleshooting Computer Problems

3.5 Given a scenario, install or replace the appropriate power supply.

Objectives	Primary Module
• Input 110–120 VAC vs. 220–240 VAC	Power Supplies and Troubleshooting Computer Problems

Objectives	Primary Module
• Output 3.3V vs. 5V vs. 12V	Power Supplies and Troubleshooting Computer Problems
• 20-pin to 24-pin motherboard adapter	Power Supplies and Troubleshooting Computer Problems
• Redundant power supply	Power Supplies and Troubleshooting Computer Problems
• Modular power supply	Power Supplies and Troubleshooting Computer Problems
• Wattage rating	Power Supplies and Troubleshooting Computer Problems

3.6 Given a scenario, deploy and configure multifunction devices/printers and settings.

Objectives	Primary Module
• Properly unboxing a device – setup location considerations	Supporting Printers
• Use appropriate drivers for a given OS	Supporting Printers

Objectives	Primary Module
• Printer Control Language (PCL) vs. PostScript	Supporting Printers
• Device connectivity	Supporting Printers
• USB	Supporting Printers
• Ethernet	Supporting Printers
• Wireless	Supporting Printers
• Public/shared devices	Supporting Printers
• Printer share	Supporting Printers
• Print server	Supporting Printers
• Configuration settings	Supporting Printers
• Duplex	Supporting Printers
• Orientation	Supporting Printers
• Tray settings	Supporting Printers

Objectives	Primary Module
• Quality	Supporting Printers
• Security	Supporting Printers
• User authentication	Supporting Printers
• Badging	Supporting Printers
• Audit logs	Supporting Printers
• Secured prints	Supporting Printers
• Network scan services	Supporting Printers
• Email	Supporting Printers
• SMB	Supporting Printers
• Cloud services	Supporting Printers
• Automatic document feeder (ADF)/flatbed scanner	Supporting Printers

3.7 Given a scenario, install and replace printer consumables.

Objectives	Primary Module
• Laser	Supporting Printers
• Imaging drum, fuser assembly, transfer belt, transfer roller, pickup rollers, separation pads, duplexing assembly	Supporting Printers
• Imaging process: processing, charging, exposing, developing, transferring, fusing, and cleaning	Supporting Printers
• Maintenance: Replace toner, apply maintenance kit, calibrate, clean	Supporting Printers
• Inkjet	Supporting Printers
• Ink cartridge, print head, roller, feeder, duplexing assembly, carriage belt	Supporting Printers
• Calibration	Supporting Printers
• Maintenance: Clean heads, replace cartridges, calibrate, clear jams	Supporting Printers

Objectives	Primary Module
• Thermal	Supporting Printers
• Feed assembly, heating element	Supporting Printers
• Special thermal paper	Supporting Printers
• Maintenance: Replace paper, clean heating element, remove debris	Supporting Printers
• Heat sensitivity of paper	Supporting Printers
• Impact	Supporting Printers
• Print head, ribbon, tractor feed	Supporting Printers
• Impact paper	Supporting Printers

Objectives	Primary Module
• Maintenance: Replace ribbon, replace print head, replace paper	Supporting Printers
• 3-D printer	Supporting Printers
• Filament	Supporting Printers
• Resin	Supporting Printers
• Print bed	Supporting Printers

4.0 Virtualization and Cloud Computing

4.1 Summarize cloud-computing concepts.

Objectives	Primary Module
• Common cloud models	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• Private cloud	Network Infrastructure and Cloud Computing
• Public cloud	Network Infrastructure and Cloud Computing
• Hybrid cloud	Network Infrastructure and Cloud Computing
• Community cloud	Network Infrastructure and Cloud Computing
• Infrastructure as a service (IaaS)	Network Infrastructure and Cloud Computing
• Software as a service (SaaS)	Network Infrastructure and Cloud Computing
• Platform as a service (PaaS)	Network Infrastructure and Cloud Computing
• Cloud characteristics	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• Shared resources	Network Infrastructure and Cloud Computing
• Metered utilization	Network Infrastructure and Cloud Computing
• Rapid elasticity	Network Infrastructure and Cloud Computing
• High availability	Network Infrastructure and Cloud Computing
• File synchronization	Network Infrastructure and Cloud Computing
• Desktop virtualization	Network Infrastructure and Cloud Computing
• Virtual desktop infrastructure (VDI) on premises	Network Infrastructure and Cloud Computing
• VDI in the cloud	Network Infrastructure and Cloud Computing

4.2 Summarize aspects of client-side virtualization.

Objectives	Primary Module
• Purpose of virtual machines	Network Infrastructure and Cloud Computing
• Sandbox	Network Infrastructure and Cloud Computing
• Test development	Network Infrastructure and Cloud Computing
• Application virtualization	Network Infrastructure and Cloud Computing
• Legacy software/OS	Network Infrastructure and Cloud Computing
• Cross-platform virtualization	Network Infrastructure and Cloud Computing
• Resource requirements	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• Security requirements	Network Infrastructure and Cloud Computing

5.0 Hardware and Network Troubleshooting

5.1 Given a scenario, apply the best practice methodology to resolve problems.

Objectives	Primary Module
• Always consider corporate policies, procedures, and impacts before implementing changes	Power Supplies and Troubleshooting Computer Problems
1. Identify the problem	Power Supplies and Troubleshooting Computer Problems
• Gather information from the user, identify user changes, and, if applicable, perform backups before making changes	Power Supplies and Troubleshooting Computer Problems
• Inquire regarding environmental or infrastructure changes	Power Supplies and Troubleshooting

Objectives	Primary Module
	Computer Problems
2. Establish a theory of probable cause (question the obvious)	Power Supplies and Troubleshooting Computer Problems
• If necessary, conduct external or internal research based on symptoms	Power Supplies and Troubleshooting Computer Problems
3. Test the theory to determine the cause	Power Supplies and Troubleshooting Computer Problems
• Once the theory is confirmed, determine the next steps to resolve the problem	Power Supplies and Troubleshooting Computer Problems
• If the theory is not confirmed, re-establish a new theory or escalate	Power Supplies and Troubleshooting Computer Problems
4. Establish a plan of action to resolve the problem and implement the solution	Power Supplies and Troubleshooting Computer Problems

Objectives	Primary Module
• Refer to the vendor’s instructions for guidance	Power Supplies and Troubleshooting Computer Problems
5. Verify full system functionality and, if applicable, implement preventive measures	Power Supplies and Troubleshooting Computer Problems
6. Document the findings, actions, and outcomes	Power Supplies and Troubleshooting Computer Problems

5.2 Given a scenario, troubleshoot problems related to motherboards, RAM, CPU, and power.

Objectives	Primary Module
• Common symptoms	Power Supplies and Troubleshooting Computer Problems
• Power-on self-test (POST) beeps	Power Supplies and Troubleshooting Computer Problems

Objectives	Primary Module
• Proprietary crash screens (blue screen of death [BSOD]/pinwheel)	Power Supplies and Troubleshooting Computer Problems
• Black screen	Power Supplies and Troubleshooting Computer Problems
• No power	Power Supplies and Troubleshooting Computer Problems
• Sluggish performance	Power Supplies and Troubleshooting Computer Problems
• Overheating	Power Supplies and Troubleshooting Computer Problems
• Burning smell	Power Supplies and Troubleshooting Computer Problems
• Intermittent shutdown	Power Supplies and Troubleshooting Computer Problems
• Application crashes	Power Supplies and Troubleshooting Computer Problems

Objectives	Primary Module
• Grinding noise	Power Supplies and Troubleshooting Computer Problems
• Capacitor swelling	Power Supplies and Troubleshooting Computer Problems
• Inaccurate system date/time	Power Supplies and Troubleshooting Computer Problems

5.3 Given a scenario, troubleshoot and diagnose problems with storage drives and RAID arrays.

Objectives	Primary Module
• Common symptoms	Hard Drives and Other Storage Devices
• Light-emitting diode (LED) status indicators	Hard Drives and Other Storage Devices
• Grinding noises	Hard Drives and Other Storage Devices

Objectives	Primary Module
• Clicking sounds	Hard Drives and Other Storage Devices
• Bootable device not found	Hard Drives and Other Storage Devices
• Data loss/corruption	Hard Drives and Other Storage Devices
• RAID failure	Hard Drives and Other Storage Devices
• Self-monitoring, Analysis, and Reporting Technology (S.M.A.R.T.) failure	Hard Drives and Other Storage Devices
• Extended read/write times	Hard Drives and Other Storage Devices
• Input/output operations per second (IOPS)	Hard Drives and Other Storage Devices
• Missing drives in OS	Hard Drives and Other Storage Devices

5.4 Given a scenario, troubleshoot video, projector, and display issues.

Objectives	Primary Module
• Common symptoms	Supporting I/O Devices
• Incorrect data source	Supporting I/O Devices
• Physical cabling issues	Supporting I/O Devices
• Burned-out bulb	Supporting I/O Devices
• Fuzzy image	Supporting I/O Devices
• Display burn-in	Supporting I/O Devices
• Dead pixels	Supporting I/O Devices
• Flashing screen	Supporting I/O Devices
• Incorrect color display	Supporting I/O Devices
• Audio issues	Supporting I/O Devices
• Dim image	Supporting I/O Devices

Objectives	Primary Module
• Intermittent projector shutdown	Supporting I/O Devices

5.5 Given a scenario, troubleshoot common issues with mobile devices.

Objectives	Primary Module
• Common symptoms	Supporting Mobile Devices
• Poor battery health	Supporting Mobile Devices
• Swollen battery	Supporting Mobile Devices
• Broken screen	Supporting Mobile Devices
• Improper charging	Supporting Mobile Devices
• Poor/no connectivity	Supporting Mobile Devices
• Liquid damage	Supporting Mobile Devices
• Overheating	Supporting Mobile Devices

Objectives	Primary Module
• Digitizer issues	Supporting Mobile Devices
• Physically damaged ports	Supporting Mobile Devices
• Malware	Supporting Mobile Devices
• Cursor drift/touch calibration	Supporting Mobile Devices

5.6 Given a scenario, troubleshoot and resolve printer issues.

Objectives	Primary Module
• Common symptoms	Supporting Printers
• Lines down the printed pages	Supporting Printers
• Garbled print	Supporting Printers
• Toner not fusing to paper	Supporting Printers
• Paper jams	Supporting Printers

Objectives	Primary Module
• Faded print	Supporting Printers
• Incorrect paper size	Supporting Printers
• Paper not feeding	Supporting Printers
• Multipage misfeed	Supporting Printers
• Multiple prints pending in queue	Supporting Printers
• Speckling on printed pages	Supporting Printers
• Double/echo images on the print	Supporting Printers
• Incorrect color display	Supporting Printers
• Grinding noise	Supporting Printers
• Finishing issues	Supporting Printers
• Staple jams	Supporting Printers

Objectives	Primary Module
• Hole punch	Supporting Printers
• Incorrect page orientation	Supporting Printers

5.7 Given a scenario, troubleshoot problems with wired and wireless networks.

Objectives	Primary Module
• Common symptoms	Network Infrastructure and Cloud Computing
• Intermittent wireless connectivity	Network Infrastructure and Cloud Computing
• Slow network speeds	Network Infrastructure and Cloud Computing
• Limited connectivity	Network Infrastructure and Cloud Computing
• Jitter	Network Infrastructure and Cloud Computing

Objectives	Primary Module
• Poor Voice over Internet Protocol (VoIP) quality	Network Infrastructure and Cloud Computing
• Port flapping	Network Infrastructure and Cloud Computing
• High latency	Network Infrastructure and Cloud Computing
• External interference	Network Infrastructure and Cloud Computing