

TestOut[®]

TestOut PC Pro – English 6.0.x

Objective Mappings:

TestOut PC Pro 2018
CompTIA A+ 220-1001
CompTIA A+ 220-1002

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Objective Mapping: LabSim Section to TestOut PC Pro 6.0 Objectives

The TestOut PC Pro course covers the following PC Pro 6.0 exam objectives:

Section	Title	Objectives
1.0	Computing Overview	
1.1	Course Introduction	
1.2	Hardware Basics	
1.3	Windows Basics	
1.4	Linux Basics	
1.5	macOS Basics	
2.0	PC Technician Responsibilities	
2.1	Protection and Safety	
2.2	Professionalism	
2.3	Change Management	
2.4	PC Tools	
2.5	PC Maintenance	2.5 Given a scenario, implement disaster prevention and recovery methods Install surge protection and a UPS
2.6	Troubleshooting Process Overview	
3.0	System Components	
3.1	Cases and Form Factors	

3.2	Power Supplies	1.1 Given a scenario, select and install PC components Install and connect a power supply
3.3	Motherboards and Buses	1.1 Given a scenario, select and install PC components Install and connect a motherboard
3.4	Motherboard Troubleshooting	4.1 Given a scenario, troubleshoot hardware components Troubleshoot system power
3.5	Processors	1.1 Given a scenario, select and install PC components Install a CPU and CPU fan
3.6	Processor Troubleshooting	4.1 Given a scenario, troubleshoot hardware components Troubleshoot CPU installation
3.7	Memory	
3.8	Memory Installation	1.1 Given a scenario, select and install PC components Install memory modules
3.9	Memory Troubleshooting	1.1 Given a scenario, select and install PC components Install memory modules 4.1 Given a scenario, troubleshoot hardware components Troubleshoot system memory

3.10	BIOS/UEFI	1.2 Given a scenario, configure hardware components Configure BIOS/UEFI settings
3.11	Expansion Cards	1.1 Given a scenario, select and install PC components Select and install expansion cards
3.12	Video	
3.13	Audio	2.1 Given a scenario, install, update, and configure an operating system Manage audio device settings
3.14	Cooling	
4.0	Peripheral Devices	
4.1	Peripheral Devices	
4.2	USB	1.3 Given a scenario, install and configure storage Install internal and external storage devices
4.3	Display Devices	2.1 Given a scenario, install, update, and configure an operating system Configure and optimize video adapter settings
4.4	Video Troubleshooting	
4.5	Device Driver Management	2.1 Given a scenario, install, update, and configure an operating system Manage device drivers
4.6	Device Driver Troubleshooting	
5.0	Storage	

5.1	Storage Devices	
5.2	SATA	1.3 Given a scenario, install and configure storage Install internal and external storage devices
5.3	Optical Media	
5.4	RAID	1.3 Given a scenario, install and configure storage Implement a RAID solution
5.5	File Systems	
5.6	File System Creation	1.3 Given a scenario, install and configure storage Configure and manage storage
5.7	Storage Management	1.3 Given a scenario, install and configure storage Configure and manage storage
5.8	Storage Spaces	1.3 Given a scenario, install and configure storage Configure and manage storage
5.9	Disk Optimization	1.3 Given a scenario, install and configure storage Perform disk maintenance
5.10	Storage Troubleshooting	4.1 Given a scenario, troubleshoot hardware components Troubleshoot storage devices
6.0	Networking	

6.1	Networking Overview	
6.2	Network Hardware	1.5 Given a scenario, configure networking devices Install and configure wired and wireless network adapters and cables
6.3	Networking Media	
6.4	Ethernet	
6.5	IP Networking	
6.6	IP Configuration	2.4 Given a scenario, configure PC networking Configure client IP addressing, DNS, and DHCP
6.7	IP Version 6	
6.8	Internet Connectivity	1.5 Given a scenario, configure networking devices Install and configure wired and wireless network adapters and cables Install and configure internet connection devices
6.9	Network Utilities	2.4 Given a scenario, configure PC networking Use network utilities 4.3 Given a scenario, troubleshoot networking Use networking utilities to view, test, and troubleshoot network configuration, communication, and connectivity issues
6.10	Network Troubleshooting	4.3 Given a scenario, troubleshoot networking Troubleshoot a network connection
7.0	Wireless Networking	

7.1	802.11 Wireless	1.5 Given a scenario, configure networking devices Install and configure wired and wireless network adapters and cables Install and configure internet connection devices
7.2	Infrared, Bluetooth, and NFC	
7.3	SOHO Configuration	2.4 Given a scenario, configure PC networking Configure wired and wireless networking for a SOHO
7.4	Internet of Things	2.4 Given a scenario, configure PC networking Configure wired and wireless networking for a SOHO
7.5	Wireless Network Troubleshooting	
8.0	Printing	
8.1	Printers	
8.2	Printer Configuration	1.4 Given a scenario, install and configure a printer Select and install a printer Configure printer properties Manage printing
8.3	Network Printing	1.4 Given a scenario, install and configure a printer Configure printer properties Configure network printing
8.4	Printing Management	1.4 Given a scenario, install and configure a printer Configure printer properties Manage printing

8.5	Printer Maintenance	
8.6	Printer Troubleshooting	4.1 Given a scenario, troubleshoot hardware components Troubleshoot printer issues
9.0	Mobile Devices	
9.1	Laptops	
9.2	Laptop Components	1.6 Given a scenario, manage mobile devices Install basic hardware components on laptop computers
9.3	Laptop Power Management	2.2 Given a scenario, use operating system features and utilities Configure power options and settings
9.4	Laptop Troubleshooting	
9.5	Mobile Devices	2.2 Given a scenario, use operating system features and utilities Use core macOS and iOS features
9.6	Mobile Device Networking	1.6 Given a scenario, manage mobile devices Configure mobile device connectivity Use common mobile device features 2.2 Given a scenario, use operating system features and utilities Use core macOS and iOS features
9.7	Mobile Device Security	3.2 Given a scenario, implement mobile device security Implement access control and authentication Implement device encryption

		Implement device location
9.8	Mobile Device Troubleshooting	4.1 Given a scenario, troubleshoot hardware components Troubleshoot mobile devices
10.0	System Implementation	
10.1	Component Selection	
10.2	Windows Pre-Installation	2.4 Given a scenario, configure PC networking Configure Windows workgroup and domain settings
10.3	Windows Installation	2.1 Given a scenario, install, update, and configure an operating system Install, update, and configure Windows 2.2 Given a scenario, use operating system features and utilities Use Windows features and command line utilities
10.4	Post-Installation	
10.5	Virtualization	2.7 Given a scenario, configure virtualization Enable hardware virtualization in BIOS/UEFI Install and configure a hypervisor Install and configure a virtual machine Create and add virtual hard disks
11.0	File Management	
11.1	Windows File Locations	
11.2	Manage Files on Windows	2.3 Given a scenario, manage file systems

		Manage files and folders
11.3	NTFS Permissions	2.3 Given a scenario, manage file systems Configure file access permissions
11.4	Shared Folders	2.3 Given a scenario, manage file systems Share and secure files and folders 2.4 Given a scenario, configure PC networking Configure network drive mappings
11.5	Linux File Management	2.3 Given a scenario, manage file systems Manage files and folders Configure file access permissions
12.0	System Management	
12.1	Windows System Tools	2.2 Given a scenario, use operating system features and utilities Use Windows features and command line utilities
12.2	Preferences and Settings	
12.3	Performance Monitoring	
12.4	Active Directory	
12.5	Users and Groups	2.1 Given a scenario, install, update, and configure an operating system Configure local users and groups
12.6	Remote Services	2.6 Given a scenario, implement remote access

		Configure Remote Desktop connection
12.7	Windows Application Management	2.2 Given a scenario, use operating system features and utilities Manage applications and processes
12.8	Linux Application Management	2.1 Given a scenario, install, update, and configure an operating system Install, update, and configure Linux 2.2 Given a scenario, use operating system features and utilities Manage applications and processes
12.9	Digital Content Management	
12.10	Updates	1.2 Given a scenario, configure hardware components Implement firmware updates 2.1 Given a scenario, install, update, and configure an operating system Install, update, and configure macOS Install, update, and configure Linux 3.1 Given a scenario, implement tools to detect, remove, and prevent malware Configure operating system updates
12.11	System Backup	3.1 Given a scenario, implement tools to detect, remove, and prevent malware Recover files corrupted by malware
12.12	System Recovery	2.5 Given a scenario, implement disaster prevention and recovery methods Implement image-level backup and recovery

		<p>Implement file-level backup and recovery</p> <p>3.1 Given a scenario, implement tools to detect, remove, and prevent malware</p> <p>Restore a PC or mobile device</p>
12.13	Virtual Memory	<p>2.7 Given a scenario, configure virtualization</p> <p>Install and configure a virtual machine</p>
12.14	Operating System Troubleshooting	<p>4.2 Given a scenario, troubleshoot software components</p> <p>Troubleshoot common issues Apply common solutions</p>
12.15	Windows Boot Errors	<p>1.2 Given a scenario, configure hardware components</p> <p>Configure boot options</p> <p>4.1 Given a scenario, troubleshoot hardware components</p> <p>Troubleshoot system startup Troubleshoot malfunctioning systems</p>
13.0	Security	
13.1	Security Best Practices	
13.2	Incident Response	
13.3	Physical Security	<p>3.2 Given a scenario, implement mobile device security</p> <p>Implement remote wipe capabilities</p> <p>3.3 Given a scenario, implement security best practices</p> <p>Require a screen saver password</p>

13.4	Social Engineering	
13.5	BIOS/UEFI Security	3.3 Given a scenario, implement security best practices Configure BIOS/UEFI security settings
13.6	Malware Protection	3.1 Given a scenario, implement tools to detect, remove, and prevent malware Install and configure antivirus and anti-malware utilities
13.7	Authentication	3.3 Given a scenario, implement security best practices Enforce password settings Manage Linux passwords
13.8	File Encryption	3.3 Given a scenario, implement security best practices Implement drive encryption
13.9	Network Security	
13.10	Firewalls	3.3 Given a scenario, implement security best practices Configure a firewall
13.11	Proxy Servers	3.3 Given a scenario, implement security best practices Use a proxy server
13.12	VPN	2.6 Given a scenario, implement remote access Configure a VPN connection
13.13	Security Troubleshooting	3.1 Given a scenario, implement tools to detect, remove, and prevent malware

		Install and configure antivirus and anti-malware utilities
14.0	Capstone Exercises	
A.0	PC Pro Certification Practice Exams	
A.1	Preparing for Certification	
A.2	PC Pro Domain Practice	
B.0	CompTIA A+ 220-1001 Core 1 Practice Exams	
B.1	Preparing for Certification	
B.2	A+ 220-1001 Core 1 Domain Practice (20 Random Questions)	
B.3	A+ 220-1001 Core 1 Domain Practice (All Questions)	
C.0	CompTIA A+ 220-1002 Core 2 Practice Exams	
C.1	Preparing for Certification	
C.2	A+ 220-1002 Core 2 Domain Practice (20 Random Questions)	
C.3	A+ 220-1002 Core 2 Domain Practice (All Questions)	

Objective Mapping: TestOut PC Pro 6.0 Objectives to LabSim Section

The TestOut PC Pro course and certification exam cover the following PC Pro 6.0 objectives:

#	Domain	Section
1.0	Hardware	
1.1	Given a scenario, select and install PC components Install and connect a power supply Install and connect a motherboard Install a CPU and CPU fan Install memory modules Select and install expansion cards	3.2, 3.3, 3.5, 3.8, 3.9, 3.11
1.2	Given a scenario, configure hardware components Configure boot options Configure BIOS/UEFI settings Implement firmware updates	3.10 12.10, 12.15
1.3	Given a scenario, install and configure storage Install internal and external storage devices Configure and manage storage Implement a RAID solution Perform disk maintenance	4.2 5.2, 5.4, 5.6, 5.7, 5.8, 5.9
1.4	Given a scenario, install and configure a printer Select and install a printer Configure printer properties Configure network printing Manage printing	8.2, 8.3, 8.4

1.5	<p>Given a scenario, configure networking devices</p> <p>Install and configure wired and wireless network adapters and cables Install and configure internet connection devices</p>	<p>6.2, 6.8 7.1</p>
1.6	<p>Given a scenario, manage mobile devices</p> <p>Install basic hardware components on laptop computers Configure mobile device connectivity Use common mobile device features</p>	<p>9.2, 9.6</p>
2.0	Software	
2.1	<p>Given a scenario, install, update, and configure an operating system</p> <p>Install, update, and configure Windows Install, update, and configure macOS Install, update, and configure Linux Manage device drivers Configure and optimize video adapter settings Manage audio device settings Configure local users and groups</p>	<p>3.13 4.3, 4.5 10.3 12.5, 12.8, 12.10</p>
2.2	<p>Given a scenario, use operating system features and utilities</p> <p>Use Windows features and command line utilities Use core macOS and iOS features Use common Linux command line utilities Manage applications and processes Configure power options and settings</p>	<p>9.3, 9.5, 9.6 10.3 12.1, 12.7, 12.8</p>
2.3	<p>Given a scenario, manage file systems</p> <p>Manage files and folders Configure file access permissions Share and secure files and folders</p>	<p>11.2, 11.3, 11.4, 11.5</p>
2.4	<p>Given a scenario, configure PC networking</p>	<p>6.6, 6.9</p>

	<p>Configure client IP addressing, DNS, and DHCP</p> <p>Configure Windows workgroup and domain settings</p> <p>Configure wired and wireless networking for a SOHO</p> <p>Use network utilities</p> <p>Configure network drive mappings</p>	<p>7.3, 7.4</p> <p>10.2</p> <p>11.4</p>
2.5	<p>Given a scenario, implement disaster prevention and recovery methods</p> <p>Implement image-level backup and recovery</p> <p>Implement file-level backup and recovery</p> <p>Install surge protection and a UPS</p>	<p>2.5</p> <p>12.12</p>
2.6	<p>Given a scenario, implement remote access</p> <p>Configure Remote Desktop connection</p> <p>Configure a VPN connection</p>	<p>12.6</p> <p>13.12</p>
2.7	<p>Given a scenario, configure virtualization</p> <p>Enable hardware virtualization in BIOS/UEFI</p> <p>Install and configure a hypervisor</p> <p>Install and configure a virtual machine</p> <p>Create and add virtual hard disks</p>	<p>10.5</p> <p>12.13</p>
3.0	Security	
3.1	<p>Given a scenario, implement tools to detect, remove, and prevent malware</p> <p>Install and configure antivirus and anti-malware utilities</p> <p>Restore a PC or mobile device</p> <p>Recover files corrupted by malware</p> <p>Configure operating system updates</p>	<p>12.10, 12.11, 12.12</p> <p>13.6, 13.13</p>
3.2	<p>Given a scenario, implement mobile device security</p> <p>Implement access control and authentication</p> <p>Implement device encryption</p>	<p>9.7</p> <p>13.3</p>

	<p>Implement device location Implement remote wipe capabilities</p>	
3.3	<p>Given a scenario, implement security best practices</p> <p>Enforce password settings Require a screen saver password Manage Linux passwords Implement drive encryption Configure a firewall Use a proxy server Configure BIOS/UEFI security settings</p>	13.3, 13.5, 13.7, 13.8, 13.10, 13.11
4.0	Troubleshooting	
4.1	<p>Given a scenario, troubleshoot hardware components</p> <p>Troubleshoot system startup Troubleshoot system power Troubleshoot CPU installation Troubleshoot system memory Troubleshoot storage devices Troubleshoot malfunctioning systems Troubleshoot mobile devices Troubleshoot printer issues</p>	3.4, 3.6, 3.9 5.10 8.6 9.8 12.15
4.2	<p>Given a scenario, troubleshoot software components</p> <p>Troubleshoot common issues Apply common solutions</p>	12.14
4.3	<p>Given a scenario, troubleshoot networking</p> <p>Troubleshoot a network connection Use networking utilities to view, test, and troubleshoot network configuration, communication, and connectivity issues</p>	6.9, 6.10

Objective Mapping: LabSim Section to CompTIA 220-1001 Objectives

The TestOut PC Pro course covers the following CompTIA A+ Certification 220-1001 exam objectives:

Section	Title	Objectives
1.0	Computing Overview	
1.1	Course Introduction	
1.2	Hardware Basics	<p>1.2 Given a scenario, install components within the display of a laptop.</p> <p>Microphone</p> <p>3.1 Explain basic cable types, features, and their purposes.</p> <p>Multipurpose cables</p> <ul style="list-style-type: none">○ Thunderbolt <p>Peripheral cables</p> <ul style="list-style-type: none">○ Serial <p>Hard drive cables</p> <ul style="list-style-type: none">○ SATA○ IDE○ SCSI <p>Adapters</p> <ul style="list-style-type: none">○ DVI to HDMI○ USB to Ethernet○ DVI to VGA <p>3.2 Identify common connector types.</p> <p>RJ-11 RJ-45 RS-232 DB-9 SCSI</p> <p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>ADF/flatbed scanner</p>

		Barcode scanner/QR scanner Mouse Keyboard Touchpad Game controllers Camera/webcam Microphone
1.3	Windows Basics	
1.4	Linux Basics	
1.5	macOS Basics	
2.0	PC Technician Responsibilities	
2.1	Protection and Safety	
2.2	Professionalism	
2.3	Change Management	
2.4	PC Tools	
2.5	PC Maintenance	
2.6	Troubleshooting Process Overview	<p>5.1 Given a scenario, use the best practice methodology to resolve problems.</p> <p>Always consider corporate policies, procedures, and impacts before implementing changes</p> <ol style="list-style-type: none"> 1. Identify the problem <ul style="list-style-type: none"> ○ Question the user and identify user changes to computer and perform backups before making changes ○ Inquire regarding environmental or infrastructure changes ○ Review system and application logs 2. Establish a theory of probable cause (question the obvious) <ul style="list-style-type: none"> ○ If necessary, conduct external or internal research based on symptoms 3. Test the theory to determine cause <ul style="list-style-type: none"> ○ Once the theory is confirmed, determine the next steps to resolve problem ○ If theory is not confirmed re-establish new theory or escalate 4. Establish a plan of action to resolve the problem and implement the solution 5. Verify full system functionality and, if applicable, implement preventive measures

		6. Document findings, actions, and outcomes
3.0	System Components	
3.1	Cases and Form Factors	<p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>Motherboard form factor</p> <ul style="list-style-type: none"> ○ ATX ○ mATX ○ ITX ○ mITX
3.2	Power Supplies	<p>3.2 Identify common connector types.</p> <p>Molex</p> <p>3.7 Summarize power supply types and features.</p> <p>Input 115V vs. 220V Output 5.5V vs. 12V 24-pin motherboard adapter Wattage rating Number of devices/types of devices to be powered</p>
3.3	Motherboards and Buses	<p>3.4 Given a scenario, select, install and configure storage devices.</p> <p>Magnetic hard drives</p> <ul style="list-style-type: none"> ○ Sizes - 3.5 <p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>Motherboard connectors types</p> <ul style="list-style-type: none"> ○ Front panel connector ○ Internal USB connector <p>CMOS battery Expansion cards</p> <ul style="list-style-type: none"> ○ Video cards - Onboard

3.4	Motherboard Troubleshooting	<p>5.2 Given a scenario, troubleshoot problems related to motherboards, RAM, CPUs, and power.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Unexpected shutdowns ○ System lockups ○ POST code beeps ○ Blank screen on bootup ○ BIOS time and setting resets ○ Attempts to boot to incorrect device ○ Continuous reboots ○ No power ○ Overheating ○ Loud noise ○ Intermittent device failure ○ Fans spin – no power to other devices ○ Indicator lights ○ Smoke ○ Burning smell ○ Proprietary crash screens (BSOD/pin wheel) ○ Distended capacitors ○ Log entries and error messages
3.5	Processors	<p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>Motherboard connectors types</p> <ul style="list-style-type: none"> ○ Socket types <p>CPU features</p> <ul style="list-style-type: none"> ○ Single-core ○ Multicore ○ Virtual technology ○ Hyperthreading ○ Speeds ○ Overclocking ○ Integrated GPU <p>Compatibility</p> <ul style="list-style-type: none"> ○ AMD ○ Intel
3.6	Processor Troubleshooting	

3.7	Memory	<p>3.3 Given a scenario, install RAM types.</p> <p>RAM types</p> <ul style="list-style-type: none"> ○ SODIMM ○ DDR2 ○ DDR3 ○ DDR4 <p>Error correcting Parity vs. non-parity</p>
3.8	Memory Installation	<p>3.3 Given a scenario, install RAM types.</p> <p>Single channel Dual channel Triple channel</p>
3.9	Memory Troubleshooting	<p>5.2 Given a scenario, troubleshoot problems related to motherboards, RAM, CPUs, and power.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Log entries and error messages
3.10	BIOS/UEFI	<p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>BIOS/UEFI settings</p> <ul style="list-style-type: none"> ○ Boot options ○ Security - Drive encryption - TPM ○ Security - Drive encryption - LoJack ○ Security - Drive encryption - Secure boot
3.11	Expansion Cards	<p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>Motherboard connectors types</p> <ul style="list-style-type: none"> ○ PCI ○ PCIe ○ Riser card

3.12	Video	<p>3.1 Explain basic cable types, features, and their purposes.</p> <p>Video cables</p> <ul style="list-style-type: none"> ○ VGA ○ HDMI ○ Mini-HDMI ○ DisplayPort ○ DVI ○ DVI-DDVI-I <p>3.2 Identify common connector types.</p> <p>BNC</p> <p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>Expansion cards</p> <ul style="list-style-type: none"> ○ Video cards - Onboard ○ Video cards - Add-on card <p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>Monitors</p>
3.13	Audio	<p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>Expansion cards</p> <ul style="list-style-type: none"> ○ Sound cards <p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>Speakers</p>
3.14	Cooling	<p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>Cooling mechanism</p> <ul style="list-style-type: none"> ○ Fans ○ Heat sink ○ Liquid

		<ul style="list-style-type: none"> ○ Thermal paste
4.0	Peripheral Devices	
4.1	Peripheral Devices	<p>1.2 Given a scenario, install components within the display of a laptop.</p> <p>Types</p> <ul style="list-style-type: none"> ○ LCD ○ OLED <p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>ADF/flatbed scanner Barcode scanner/QR scanner VR headset Mouse Keyboard Touchpad Signature pad Game controllers Camera/webcam Microphone Projector</p> <ul style="list-style-type: none"> ○ Lumens/brightness <p>KVM Magnetic reader/chip reader NFC/tap pay device</p>
4.2	USB	<p>3.1 Explain basic cable types, features, and their purposes.</p> <p>Multipurpose cables</p> <ul style="list-style-type: none"> ○ USB ○ USB-C ○ USB 2.0 ○ USB 3.0 <p>3.2 Identify common connector types.</p> <p>USB Micro-USB</p>

		<p>Mini-USB USB-C</p> <p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>Expansion cards</p> <ul style="list-style-type: none"> ○ USB expansion card <p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>External storage drives</p>
4.3	Display Devices	
4.4	Video Troubleshooting	<p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>Projector</p> <ul style="list-style-type: none"> ○ Lumens/brightness <p>5.4 Given a scenario, troubleshoot video, projector, and display issues.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ VGA mode ○ No image on screen ○ Overheat shutdown ○ Dead pixels ○ Artifacts ○ Incorrect color patterns ○ Dim image ○ Flickering image ○ Distorted image ○ Distorted geometry ○ Burn-in ○ Oversized images and icons ○ Multiple failed jobs in logs
4.5	Device Driver Management	<p>2.5 Summarize the properties and purposes of services provided by networked hosts.</p> <p>Legacy/embedded systems</p>

		<p>3.4 Given a scenario, select, install and configure storage devices.</p> <p>Configurations</p> <ul style="list-style-type: none"> ○ Hot swappable
4.6	Device Driver Troubleshooting	
5.0	Storage	
5.1	Storage Devices	<p>1.1 Given a scenario, install and configure laptop hardware and components.</p> <p>Hardware/device replacement</p> <ul style="list-style-type: none"> ○ Hard drive - SSD vs. hybrid vs. magnetic disk <p>3.1 Explain basic cable types, features, and their purposes.</p> <p>Hard drive cables</p> <ul style="list-style-type: none"> ○ SCSI <p>3.2 Identify common connector types.</p> <p>SCSI</p> <p>3.4 Given a scenario, select, install and configure storage devices.</p> <p>Solid-state drives</p> <ul style="list-style-type: none"> ○ M2 drives ○ NVME <p>Hybrid drives</p> <p>Hybrid drives</p> <p>Flash</p> <ul style="list-style-type: none"> ○ SD card ○ CompactFlash ○ Micro-SD card ○ Mini-SD card ○ xD <p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p>

		Motherboard connectors types
5.2	SATA	<p>3.1 Explain basic cable types, features, and their purposes.</p> <p>Hard drive cables</p> <ul style="list-style-type: none"> ○ SATA <p>3.2 Identify common connector types.</p> <p>eSATA</p> <p>3.4 Given a scenario, select, install and configure storage devices.</p> <p>Solid-state drives</p> <ul style="list-style-type: none"> ○ SATA 2.5 <p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>Motherboard connectors types</p> <ul style="list-style-type: none"> ○ SATA
5.3	Optical Media	<p>3.4 Given a scenario, select, install and configure storage devices.</p> <p>Optical drives</p> <ul style="list-style-type: none"> ○ CD-ROM/CD-RW ○ DVD-ROM/DVD-RW/DVD-RW DL ○ Blu-ray ○ BD-R ○ BD-RE <p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>Optical DVD drive</p>
5.4	RAID	<p>3.4 Given a scenario, select, install and configure storage devices.</p> <p>Configurations</p>

		<ul style="list-style-type: none"> ○ RAID 0, 1, 5, 10
5.5	File Systems	
5.6	File System Creation	
5.7	Storage Management	
5.8	Storage Spaces	
5.9	Disk Optimization	<p>3.4 Given a scenario, select, install and configure storage devices.</p> <p>Magnetic hard drives</p> <ul style="list-style-type: none"> ○ 5,400rpm ○ 7,200rpm ○ 10,000rpm ○ 15,000rpm
5.10	Storage Troubleshooting	<p>5.3 Given a scenario, troubleshoot hard drives and RAID arrays.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Slow performance ○ Loud clicking noise ○ Failure to boot ○ Drive not recognized ○ OS not found ○ RAID not found ○ RAID stops working ○ Proprietary crash screens (BSOD/pin wheel) ○ S.M.A.R.T. errors
6.0	Networking	
6.1	Networking Overview	<p>2.7 Compare and contrast Internet connection types, network types, and their features.</p> <p>Network types</p> <ul style="list-style-type: none"> ○ LAN ○ WAN ○ PAN ○ MAN

		<ul style="list-style-type: none"> ○ WMN
6.2	Network Hardware	<p>2.2 Compare and contrast common networking hardware devices.</p> <ul style="list-style-type: none"> Routers Switches <ul style="list-style-type: none"> ○ Managed ○ Unmanaged Access points Firewall Network interface card Repeater Hub Bridge Patch panel Power over Ethernet (PoE) <ul style="list-style-type: none"> ○ Injectors ○ Switch Ethernet over Power <p>2.5 Summarize the properties and purposes of services provided by networked hosts.</p> <ul style="list-style-type: none"> Server roles <ul style="list-style-type: none"> ○ Web server ○ File server ○ Print server ○ DHCP server ○ DNS server <p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <ul style="list-style-type: none"> Expansion cards <ul style="list-style-type: none"> ○ Network interface card
6.3	Networking Media	<p>3.1 Explain basic cable types, features, and their purposes.</p> <ul style="list-style-type: none"> Network cables <ul style="list-style-type: none"> ○ Ethernet - Cat 5 ○ Ethernet - Cat 5e ○ Ethernet - Cat 6

		<ul style="list-style-type: none"> ○ Ethernet - Plenum ○ Ethernet - Shielded twisted pair ○ Ethernet - Unshielded twisted pair ○ Ethernet - 568A/B ○ Fiber ○ Coaxial ○ Speed and transmission limitations <p>3.2 Identify common connector types.</p> <p>RJ-11 RJ-45 RS-232 RG-59 RG-6</p>
6.4	Ethernet	<p>2.2 Compare and contrast common networking hardware devices.</p> <p>Routers Network interface card Repeater Hub Bridge Patch panel Power over Ethernet (PoE) <ul style="list-style-type: none"> ○ Switch Ethernet over Power</p> <p>3.1 Explain basic cable types, features, and their purposes.</p> <p>Network cables</p> <ul style="list-style-type: none"> ○ Ethernet - Cat 5 ○ Ethernet - Cat 5e ○ Ethernet - Cat 6 ○ Ethernet - Unshielded twisted pair ○ Fiber ○ Coaxial ○ Speed and transmission limitations

6.5	IP Networking	<p>2.1 Compare and contrast TCP and UDP ports, protocols, and their purposes.</p> <p>Ports and protocols</p> <ul style="list-style-type: none"> ○ 21 – FTP ○ 22 – SSH ○ 23 – Telnet ○ 25 – SMTP ○ 53 – DNS ○ 80 – HTTP ○ 110 – POP3 ○ 143 – IMAP ○ 443 – HTTPS ○ 3389 – RDP ○ 137-139 – NetBIOS/NetBT ○ 445 – SMB/CIFS ○ 427 – SLP ○ 548 – AFP ○ 67/68 – DHCP ○ 389 – LDAP ○ 161/162 – SNMP <p>TCP vs. UDP</p>
6.6	IP Configuration	<p>2.6 Explain common network configuration concepts.</p> <p>IP addressing</p> <ul style="list-style-type: none"> ○ Static ○ Dynamic ○ APIPA ○ Link local <p>DNS IPv4 vs. IPv6 Subnet mask Gateway</p>
6.7	IP Version 6	<p>2.6 Explain common network configuration concepts.</p> <p>IP addressing IPv4 vs. IPv6</p>

6.8	Internet Connectivity	<p>2.2 Compare and contrast common networking hardware devices.</p> <p style="padding-left: 40px;">Cable/DSL modem</p> <p>2.3 Given a scenario, install and configure a basic wired/wireless SOHO network.</p> <p style="padding-left: 40px;">Cable/DSL modem configuration</p> <p>2.7 Compare and contrast Internet connection types, network types, and their features.</p> <p style="padding-left: 40px;">Internet connection types</p> <ul style="list-style-type: none"> ○ Cable ○ DSL ○ Dial-up ○ Fiber ○ Satellite ○ ISDN ○ Cellular - Tethering ○ Cellular - Mobile hotspot ○ Line-of-sight wireless Internet service
6.9	Network Utilities	
6.10	Network Troubleshooting	<p>1.5 Given a scenario, connect and configure accessories and ports of other mobile devices.</p> <p style="padding-left: 40px;">Connection types</p> <ul style="list-style-type: none"> ○ Wired - Micro-USB/Mini-USB/USB-C ○ Wired - Lightning ○ Wired - Proprietary vendor-specific ports (communication/power) <p>2.8 Given a scenario, use appropriate networking tools.</p> <p style="padding-left: 40px;">Crimper Cable stripper Multimeter Tone generator and probe Cable tester Loopback plug Punchdown tool</p>

5.7 Given a scenario, troubleshoot common wired and wireless network problems.

Common symptoms

- Limited connectivity
- Unavailable resources - Internet
- Unavailable resources - Local resources - Shares
- Unavailable resources - Local resources - Printers
- Unavailable resources - Local resources - Email
- No connectivity
- APIPA/link local address
- Intermittent connectivity
- IP conflict
- Slow transfer speeds
- Low RF signal
- SSID not found

7.0

Wireless Networking

7.1

802.11 Wireless

1.2 Given a scenario, install components within the display of a laptop.

WiFi antenna connector/placement

2.3 Given a scenario, install and configure a basic wired/wireless SOHO network.

Wireless settings

- Encryption

2.4 Compare and contrast wireless networking protocols.

802.11a

802.11b

802.11g

802.11n

802.11ac

Frequencies

- 2.4Ghz
- 5Ghz

2.5 Summarize the properties and purposes of services provided by networked hosts.

Server roles

		<ul style="list-style-type: none"> ○ Authentication server <p>3.9 Given a scenario, install and configure common devices.</p> <p>Laptop/common mobile devices</p> <ul style="list-style-type: none"> ○ Wireless settings
7.2	Infrared, Bluetooth, and NFC	<p>1.5 Given a scenario, connect and configure accessories and ports of other mobile devices.</p> <p>Connection types</p> <ul style="list-style-type: none"> ○ Wired - Proprietary vendor-specific ports (communication/power) ○ Wireless - NFC ○ Wireless - Bluetooth ○ Wireless - IR ○ Wireless - Hotspot <p>1.6 Given a scenario, configure basic mobile device network connectivity and application support.</p> <p>Bluetooth</p> <ul style="list-style-type: none"> ○ Enable Bluetooth ○ Enable pairing ○ Find a device for pairing ○ Enter the appropriate pin code ○ Test connectivity <p>2.4 Compare and contrast wireless networking protocols.</p> <p>Bluetooth NFC</p>
7.3	SOHO Configuration	<p>1.5 Given a scenario, connect and configure accessories and ports of other mobile devices.</p> <p>Connection types</p> <ul style="list-style-type: none"> ○ Wired - Micro-USB/Mini-USB/USB-C ○ Wired - Lightning ○ Wired - Tethering ○ Wired - Proprietary vendor-specific ports (communication/power)

		<p>2.3 Given a scenario, install and configure a basic wired/wireless SOHO network.</p> <ul style="list-style-type: none"> Router/switch functionality Access point settings IP addressing NIC configuration <ul style="list-style-type: none"> ○ Wired ○ Wireless End-user device configuration Firewall settings <ul style="list-style-type: none"> ○ DMZ ○ Port forwarding ○ NAT ○ UPnP ○ Whitelist/blacklist ○ MAC filtering QoS Wireless settings <ul style="list-style-type: none"> ○ Channels ○ QoS <p>2.4 Compare and contrast wireless networking protocols.</p> <ul style="list-style-type: none"> Channels <ul style="list-style-type: none"> ○ 1–11 <p>2.6 Explain common network configuration concepts.</p> <p>NAT</p>
7.4	Internet of Things	<p>2.3 Given a scenario, install and configure a basic wired/wireless SOHO network.</p> <ul style="list-style-type: none"> IoT device configuration <ul style="list-style-type: none"> ○ Thermostat ○ Light switches ○ Security cameras ○ Door locks ○ Voice-enabled, smart speaker/digital assistant <p>2.4 Compare and contrast wireless networking protocols.</p>

		Zigbee Z-Wave
7.5	Wireless Network Troubleshooting	<p>2.8 Given a scenario, use appropriate networking tools.</p> <p>WiFi analyzer</p> <p>5.7 Given a scenario, troubleshoot common wired and wireless network problems.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Limited connectivity ○ No connectivity ○ Intermittent connectivity ○ Slow transfer speeds ○ Low RF signal ○ SSID not found ○ No connectivity ○ Intermittent connectivity ○ Slow transfer speeds ○ Low RF signal ○ SSID not found
8.0	Printing	
8.1	Printers	<p>3.11 Given a scenario, install and maintain various print technologies.</p> <p>Laser</p> <ul style="list-style-type: none"> ○ Imaging drum, fuser assembly, transfer belt, transfer roller, pickup rollers, separate pads, duplexing assembly ○ Imaging process: processing, charging, exposing, developing, transferring, fusing, and cleaning <p>Inkjet</p> <ul style="list-style-type: none"> ○ Ink cartridge, print head, roller, feeder, duplexing assembly, carriage, and belt ○ Calibrate <p>Thermal</p> <ul style="list-style-type: none"> ○ Feed assembly, heating element ○ Special thermal paper <p>Impact</p> <ul style="list-style-type: none"> ○ Print head, ribbon, tractor feed ○ Impact paper

		<p>3D printers</p> <ul style="list-style-type: none"> ○ Plastic filament
8.2	Printer Configuration	<p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>Printer</p> <p>3.10 Given a scenario, configure SOHO multifunction devices/printers and settings.</p> <p>Use appropriate drivers for a given operating system</p> <ul style="list-style-type: none"> ○ Configuration settings - Duplex ○ Configuration settings - Collate ○ Configuration settings - Orientation ○ Configuration settings - Quality <p>3.11 Given a scenario, install and maintain various print technologies.</p> <p>Virtual</p> <ul style="list-style-type: none"> ○ Print to file ○ Print to PDF ○ Print to XPS ○ Print to image
8.3	Network Printing	<p>3.10 Given a scenario, configure SOHO multifunction devices/printers and settings.</p> <p>Device sharing</p> <ul style="list-style-type: none"> ○ Wired - USB ○ Wired - Serial ○ Wired - Ethernet ○ Wireless - Bluetooth ○ Wireless - 802.11(a, b, g, n, ac) ○ Wireless - Infrastructure vs. ad hoc ○ Integrated print server (hardware) ○ Cloud printing/remote printing <p>Public/shared devices</p> <ul style="list-style-type: none"> ○ Sharing local/networked device via operating system settings - TCP/Bonjour/AirPrint ○ Data privacy - User authentication on the device ○ Data privacy - Hard drive caching

8.4	Printing Management	<p>3.10 Given a scenario, configure SOHO multifunction devices/printers and settings.</p> <p>Use appropriate drivers for a given operating system</p> <ul style="list-style-type: none"> ○ Configuration settings - Duplex ○ Configuration settings - Collate ○ Configuration settings - Orientation ○ Configuration settings - Quality
8.5	Printer Maintenance	<p>3.11 Given a scenario, install and maintain various print technologies.</p> <p>Laser</p> <ul style="list-style-type: none"> ○ Maintenance: Replace toner, apply maintenance kit, calibrate, clean <p>Inkjet</p> <ul style="list-style-type: none"> ○ Maintenance: Clean heads, replace cartridges, calibrate, clear jams <p>Thermal</p> <ul style="list-style-type: none"> ○ Maintenance: Replace paper, clean heating element, remove debris <p>Impact</p> <ul style="list-style-type: none"> ○ Maintenance: Replace ribbon, replace print head, replace paper
8.6	Printer Troubleshooting	<p>5.6 Given a scenario, troubleshoot printers.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Streaks ○ Faded prints ○ Ghost images ○ Toner not fused to the paper ○ Creased paper ○ Paper not feeding ○ Paper jam ○ No connectivity ○ Garbled characters on paper ○ Vertical lines on page ○ Backed-up print queue ○ Low memory errors ○ Access denied ○ Printer will not print ○ Color prints in wrong print color ○ Unable to install printer ○ Error codes ○ Printing blank pages

		<ul style="list-style-type: none"> ○ No image on printer display
9.0	Mobile Devices	
9.1	Laptops	<p>1.3 Given a scenario, use appropriate laptop features.</p> <p>Special function keys</p> <ul style="list-style-type: none"> ○ Dual displays ○ Wireless (on/off) ○ Cellular (on/off) ○ Volume settings ○ Screen brightness ○ Bluetooth (on/off) ○ Keyboard backlight ○ Touchpad (on/off) ○ Screen orientation ○ Media options (fast forward/rewind) ○ GPS (on/off) ○ Airplane mode <p>Docking station Port replicator Physical laptop lock and cable lock Rotating/removable screens</p> <p>3.4 Given a scenario, select, install and configure storage devices.</p> <p>Magnetic hard drives</p> <ul style="list-style-type: none"> ○ Sizes - 2.5 ○ Sizes - 3.5
9.2	Laptop Components	<p>1.1 Given a scenario, install and configure laptop hardware and components.</p> <p>Hardware/device replacement</p> <ul style="list-style-type: none"> ○ Keyboard ○ Hard drive - SSD vs. hybrid vs. magnetic disk ○ Hard drive - 1.8in vs. 2.5in ○ Memory ○ Smart card reader ○ Optical drive ○ Wireless card/Bluetooth module ○ Cellular card

- Video card
- Mini PCIe
- Screen
- DC jack
- Battery
- Touchpad
- Plastics/frames
- Speaker
- System board
- CPU

1.2 Given a scenario, install components within the display of a laptop.

Types

- LCD
- OLED

WiFi antenna connector/placement

Webcam

Microphone

Inverter

Digitizer/touchscreen

3.4 Given a scenario, select, install and configure storage devices.

Magnetic hard drives

- Sizes - 2.5
- Sizes - 3.5

3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.

Expansion cards

- Video cards - Add-on card

3.9 Given a scenario, install and configure common devices.

Laptop/common mobile devices

- Touchpad configuration

5.5 Given a scenario, troubleshoot common mobile device issues while adhering to the appropriate procedures.

		<p>Disassembling processes for proper reassembly</p> <ul style="list-style-type: none"> ○ Document and label cable and screw locations ○ Organize parts ○ Refer to manufacturer resources ○ Use appropriate hand tools
9.3	Laptop Power Management	
9.4	Laptop Troubleshooting	<p>1.2 Given a scenario, install components within the display of a laptop.</p> <p>Types Digitizer/touchscreen</p> <p>5.5 Given a scenario, troubleshoot common mobile device issues while adhering to the appropriate procedures.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ No display ○ Dim display ○ Flickering display ○ Sticking keys ○ Intermittent wireless ○ Battery not charging ○ Ghost cursor/pointer drift ○ No power ○ Num lock indicator lights ○ No wireless connectivity ○ No Bluetooth connectivity ○ Cannot display to external monitor ○ Touchscreen non-responsive ○ Apps not loading ○ Slow performance ○ Unable to decrypt email ○ Extremely short battery life ○ Overheating ○ Frozen system ○ No sound from speakers ○ GPS not functioning ○ Swollen battery

9.5	Mobile Devices	<p>1.2 Given a scenario, install components within the display of a laptop.</p> <p>Types Webcam</p> <p>1.4 Compare and contrast characteristics of various types of other mobile devices.</p> <p>Tablets Smartphones Wearable technology devices <ul style="list-style-type: none"> ○ Smart watches ○ Fitness monitors ○ VR/AR headsets E-readers GPS</p> <p>1.5 Given a scenario, connect and configure accessories and ports of other mobile devices.</p> <p>Accessories <ul style="list-style-type: none"> ○ Headsets ○ Speakers ○ Game pads ○ Extra battery packs/battery chargers ○ Protective covers/waterproofing ○ Credit card readers ○ Memory/MicroSD </p> <p>1.6 Given a scenario, configure basic mobile device network connectivity and application support.</p> <p>PRI updates/PRL updates/baseband updates Radio firmware IMEI vs. IMSI</p> <p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>Headset NFC/tap pay device</p> <p>3.9 Given a scenario, install and configure common devices.</p>
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		<p>Laptop/common mobile devices</p> <ul style="list-style-type: none"> ○ Touchscreen configuration ○ Application installations/configurations
9.6	Mobile Device Networking	<p>1.5 Given a scenario, connect and configure accessories and ports of other mobile devices.</p> <p>Connection types</p> <ul style="list-style-type: none"> ○ Wired - Lightning ○ Wired - Tethering ○ Wired - Proprietary vendor-specific ports (communication/power) ○ Wireless - NFC ○ Wireless - Bluetooth ○ Wireless - IR ○ Wireless - Hotspot <p>1.6 Given a scenario, configure basic mobile device network connectivity and application support.</p> <p>Corporate and ISP email configuration</p> <ul style="list-style-type: none"> ○ POP3 ○ IMAP ○ Port and SSL settings ○ S/MIME <p>Integrated commercial provider email configuration</p> <ul style="list-style-type: none"> ○ iCloud ○ Google/Inbox ○ Exchange Online ○ Yahoo <p>VPN</p> <p>1.7 Given a scenario, use methods to perform mobile device synchronization.</p> <p>Synchronization methods</p> <ul style="list-style-type: none"> ○ Synchronize to the cloud ○ Synchronize to the desktop ○ Synchronize to the automobile <p>Types of data to synchronize</p> <ul style="list-style-type: none"> ○ Contacts ○ Applications ○ Email ○ Pictures

- Music
- Videos
- Calendar
- Bookmarks
- Documents
- Location data
- Social media data
- E-books
- Passwords

Mutual authentication for multiple services (SSO)
Software requirements to install the application on the PC
Connection types to enable synchronization

2.4 Compare and contrast wireless networking protocols.

3G
4G
5G
LTE

2.6 Explain common network configuration concepts.

VPN

3.1 Explain basic cable types, features, and their purposes.

Multipurpose cables

- Lightning

3.2 Identify common connector types.

Lightning

3.9 Given a scenario, install and configure common devices.

Laptop/common mobile devices

- Synchronization settings
- Account setup/settings
- Wireless settings

9.7	Mobile Device Security	
9.8	Mobile Device Troubleshooting	<p>5.5 Given a scenario, troubleshoot common mobile device issues while adhering to the appropriate procedures.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ No display ○ Dim display ○ Flickering display ○ Sticking keys ○ Intermittent wireless ○ Battery not charging ○ Ghost cursor/pointer drift ○ No power ○ Num lock indicator lights ○ No wireless connectivity ○ No Bluetooth connectivity ○ Cannot display to external monitor ○ Touchscreen non-responsive ○ Apps not loading ○ Slow performance ○ Unable to decrypt email ○ Extremely short battery life ○ Overheating ○ Frozen system ○ No sound from speakers ○ GPS not functioning ○ Swollen battery
10.0	System Implementation	
10.1	Component Selection	<p>3.8 Given a scenario, select and configure appropriate components for a custom PC configuration to meet customer specifications or needs.</p> <p>Graphic/CAD/CAM design workstation</p> <ul style="list-style-type: none"> ○ Multicore processor ○ High-end video ○ Maximum RAM <p>Audio/video editing workstation</p> <ul style="list-style-type: none"> ○ Specialized audio and video card ○ Large, fast hard drive ○ Dual monitors

		<ul style="list-style-type: none"> Virtualization workstation <ul style="list-style-type: none"> ○ Maximum RAM and CPU cores Gaming PC <ul style="list-style-type: none"> ○ Multicore processor ○ High-end video/specialized GPU ○ High-definition sound card ○ High-end cooling Standard thick client <ul style="list-style-type: none"> ○ Desktop applications ○ Meets recommended requirements for selected OS Thin client <ul style="list-style-type: none"> ○ Basic applications ○ Meets minimum requirements for selected OS ○ Network connectivity Network attached storage device <ul style="list-style-type: none"> ○ Media streaming ○ File sharing ○ Gigabit NIC ○ RAID array <p>3.9 Given a scenario, install and configure common devices.</p> <p>Desktop</p> <ul style="list-style-type: none"> ○ Thin client ○ Thick client
10.2	Windows Pre-Installation	<p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>External storage drives</p> <p>3.9 Given a scenario, install and configure common devices.</p> <p>Desktop</p> <ul style="list-style-type: none"> ○ Account setup/settings
10.3	Windows Installation	
10.4	Post-Installation	
10.5	Virtualization	2.2 Compare and contrast common networking hardware devices.

		<p>Cloud-based network controller</p> <p>2.6 Explain common network configuration concepts.</p> <p>VLAN</p> <p>4.1 Compare and contrast cloud computing concepts.</p> <p>Common cloud models</p> <ul style="list-style-type: none"> ○ IaaS ○ SaaS ○ PaaS ○ Public vs. private vs. hybrid vs. community <p>Shared resources</p> <ul style="list-style-type: none"> ○ Internal vs. external <p>Rapid elasticity</p> <p>On-demand</p> <p>Resource pooling</p> <p>Measured service</p> <p>Metered</p> <p>Off-site email applications</p> <p>Cloud file storage services</p> <ul style="list-style-type: none"> ○ Synchronization apps <p>Virtual application streaming/cloud-based applications</p> <ul style="list-style-type: none"> ○ Applications for cell phones/tablets ○ Applications for laptops/desktops <p>Virtual desktop</p> <ul style="list-style-type: none"> ○ Virtual NIC <p>4.2 Given a scenario, set up and configure client-side virtualization.</p> <p>Purpose of virtual machines</p> <p>Resource requirements</p> <p>Emulator requirements</p> <p>Security requirements</p> <p>Network requirements</p> <p>Hypervisor</p>
11.0	File Management	
11.1	Windows File Locations	

11.2	Manage Files on Windows	
11.3	NTFS Permissions	3.9 Given a scenario, install and configure common devices. Laptop/common mobile devices ○ Touchscreen configuration
11.4	Shared Folders	
11.5	Linux File Management	
12.0	System Management	
12.1	Windows System Tools	
12.2	Preferences and Settings	
12.3	Performance Monitoring	
12.4	Active Directory	
12.5	Users and Groups	
12.6	Remote Services	
12.7	Windows Application Management	
12.8	Linux Application Management	
12.9	Digital Content Management	
12.10	Updates	
12.11	System Backup	
12.12	System Recovery	
12.13	Virtual Memory	
12.14	Operating System Troubleshooting	
12.15	Windows Boot Errors	
13.0	Security	
13.1	Security Best Practices	
13.2	Incident Response	

13.3	Physical Security	
13.4	Social Engineering	
13.5	BIOS/UEFI Security	<p>3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p> <p>BIOS/UEFI settings</p> <ul style="list-style-type: none"> ○ Firmware updates ○ Security settings ○ Interface configurations ○ Security - Passwords
13.6	Malware Protection	<p>2.5 Summarize the properties and purposes of services provided by networked hosts.</p> <p>Server roles</p> <ul style="list-style-type: none"> ○ Mail server
13.7	Authentication	<p>2.4 Compare and contrast wireless networking protocols.</p> <p>RFID</p> <p>3.6 Explain the purposes and uses of various peripheral types.</p> <p>Smart card reader Smart card reader</p>
13.8	File Encryption	
13.9	Network Security	<p>2.3 Given a scenario, install and configure a basic wired/wireless SOHO network.</p> <p>Firewall settings</p> <ul style="list-style-type: none"> ○ MAC filtering
13.10	Firewalls	<p>2.5 Summarize the properties and purposes of services provided by networked hosts.</p> <p>Server roles</p> <ul style="list-style-type: none"> ○ syslog <p>Internet appliance</p> <ul style="list-style-type: none"> ○ UTM

		<ul style="list-style-type: none"> ○ IDS ○ IPS ○ End-point management server
13.11	Proxy Servers	<p>2.5 Summarize the properties and purposes of services provided by networked hosts.</p> <p>Server roles</p> <ul style="list-style-type: none"> ○ Proxy server
13.12	VPN	<p>2.6 Explain common network configuration concepts.</p> <p>VPN</p>
13.13	Security Troubleshooting	
14.0	Capstone Exercises	
A.0	PC Pro Certification Practice Exams	
A.1	Preparing for Certification	
A.2	PC Pro Domain Practice	
B.0	CompTIA A+ 220-1001 Core 1 Practice Exams	
B.1	Preparing for Certification	
B.2	A+ 220-1001 Core 1 Domain Practice (20 Random Questions)	
B.3	A+ 220-1001 Core 1 Domain Practice (All Questions)	
C.0	CompTIA A+ 220-1002 Core 2 Practice Exams	
C.1	Preparing for Certification	
C.2	A+ 220-1002 Core 2 Domain Practice (20 Random Questions)	

C.3	A+ 220-1002 Core 2 Domain Practice (All Questions)	
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Objective Mapping: CompTIA 220-2201 Objectives to LabSim Section

The TestOut PC Pro course and certification exam cover the following CompTIA A+ Certification 220-1001 objectives:

#	Domain	Section
1.0	Mobile Devices	
1.1	<p>Given a scenario, install and configure laptop hardware and components.</p> <p>Hardware/device replacement</p> <ul style="list-style-type: none"> ○ Keyboard ○ Hard drive - SSD vs. hybrid vs. magnetic disk ○ Hard drive - 1.8in vs. 2.5in ○ Memory ○ Smart card reader ○ Optical drive ○ Wireless card/Bluetooth module ○ Cellular card ○ Video card ○ Mini PCIe ○ Screen ○ DC jack ○ Battery ○ Touchpad ○ Plastics/frames ○ Speaker ○ System board ○ CPU 	<p>5.1 9.2</p>
1.2	<p>Given a scenario, install components within the display of a laptop.</p> <p>Types</p> <ul style="list-style-type: none"> ○ LCD ○ OLED <p>WiFi antenna connector/placement Webcam Microphone Inverter</p>	<p>1.2 4.1 7.1 9.2, 9.4, 9.5</p>

	Digitizer/touchscreen	
1.3	<p>Given a scenario, use appropriate laptop features.</p> <p>Special function keys</p> <ul style="list-style-type: none"> ○ Dual displays ○ Wireless (on/off) ○ Cellular (on/off) ○ Volume settings ○ Screen brightness ○ Bluetooth (on/off) ○ Keyboard backlight ○ Touchpad (on/off) ○ Screen orientation ○ Media options (fast forward/rewind) ○ GPS (on/off) ○ Airplane mode <p>Docking station Port replicator Physical laptop lock and cable lock Rotating/removable screens</p>	9.1
1.4	<p>Compare and contrast characteristics of various types of other mobile devices.</p> <p>Tablets Smartphones Wearable technology devices</p> <ul style="list-style-type: none"> ○ Smart watches ○ Fitness monitors ○ VR/AR headsets <p>E-readers GPS</p>	9.5
1.5	<p>Given a scenario, connect and configure accessories and ports of other mobile devices.</p> <p>Connection types</p> <ul style="list-style-type: none"> ○ Wired - Micro-USB/Mini-USB/USB-C ○ Wired - Lightning ○ Wired - Tethering ○ Wired - Proprietary vendor-specific ports (communication/power) 	6.10 7.2, 7.3 9.5, 9.6

	<ul style="list-style-type: none"> ○ Wireless - NFC ○ Wireless - Bluetooth ○ Wireless - IR ○ Wireless - Hotspot <p>Accessories</p> <ul style="list-style-type: none"> ○ Headsets ○ Speakers ○ Game pads ○ Extra battery packs/battery chargers ○ Protective covers/waterproofing ○ Credit card readers ○ Memory/MicroSD 	
1.6	<p>Given a scenario, configure basic mobile device network connectivity and application support.</p> <p>Wireless/cellular data network (enable/disable)</p> <ul style="list-style-type: none"> ○ Hotspot ○ Tethering ○ Airplane mode <p>Bluetooth</p> <ul style="list-style-type: none"> ○ Enable Bluetooth ○ Enable pairing ○ Find a device for pairing ○ Enter the appropriate pin code ○ Test connectivity <p>Corporate and ISP email configuration</p> <ul style="list-style-type: none"> ○ POP3 ○ IMAP ○ Port and SSL settings ○ S/MIME <p>Integrated commercial provider email configuration</p> <ul style="list-style-type: none"> ○ iCloud ○ Google/Inbox ○ Exchange Online ○ Yahoo <p>PRI updates/PRL updates/baseband updates</p> <p>Radio firmware</p> <p>IMEI vs. IMSI</p> <p>VPN</p>	<p>7.2</p> <p>9.5, 9.6</p>
1.7	<p>Given a scenario, use methods to perform mobile device synchronization.</p>	<p>9.6</p>

	<p>Synchronization methods</p> <ul style="list-style-type: none"> ○ Synchronize to the cloud ○ Synchronize to the desktop ○ Synchronize to the automobile <p>Types of data to synchronize</p> <ul style="list-style-type: none"> ○ Contacts ○ Applications ○ Email ○ Pictures ○ Music ○ Videos ○ Calendar ○ Bookmarks ○ Documents ○ Location data ○ Social media data ○ E-books ○ Passwords <p>Mutual authentication for multiple services (SSO) Software requirements to install the application on the PC Connection types to enable synchronization</p>	
2.0	Networking	
2.1	<p>Compare and contrast TCP and UDP ports, protocols, and their purposes.</p> <p>Ports and protocols</p> <ul style="list-style-type: none"> ○ 21 – FTP ○ 22 – SSH ○ 23 – Telnet ○ 25 – SMTP ○ 53 – DNS ○ 80 – HTTP ○ 110 – POP3 ○ 143 – IMAP ○ 443 – HTTPS ○ 3389 – RDP ○ 137-139 – NetBIOS/NetBT ○ 445 – SMB/CIFS ○ 427 – SLP ○ 548 – AFP 	6.5

	<ul style="list-style-type: none"> ○ 67/68 – DHCP ○ 389 – LDAP ○ 161/162 – SNMP <p>TCP vs. UDP</p>	
2.2	<p>Compare and contrast common networking hardware devices.</p> <p>Routers</p> <p>Switches</p> <ul style="list-style-type: none"> ○ Managed ○ Unmanaged <p>Access points</p> <p>Cloud-based network controller</p> <p>Firewall</p> <p>Network interface card</p> <p>Repeater</p> <p>Hub</p> <p>Cable/DSL modem</p> <p>Bridge</p> <p>Patch panel</p> <p>Power over Ethernet (PoE)</p> <ul style="list-style-type: none"> ○ Injectors ○ Switch <p>Ethernet over Power</p>	6.2, 6.4, 6.8 10.5
2.3	<p>Given a scenario, install and configure a basic wired/wireless SOHO network.</p> <p>Router/switch functionality</p> <p>Access point settings</p> <p>IP addressing</p> <p>NIC configuration</p> <ul style="list-style-type: none"> ○ Wired ○ Wireless <p>End-user device configuration</p> <p>IoT device configuration</p> <ul style="list-style-type: none"> ○ Thermostat ○ Light switches ○ Security cameras ○ Door locks ○ Voice-enabled, smart speaker/digital assistant <p>Cable/DSL modem configuration</p>	6.8 7.1, 7.3, 7.4 13.9

	<ul style="list-style-type: none"> Firewall settings <ul style="list-style-type: none"> ○ DMZ ○ Port forwarding ○ NAT ○ UPnP ○ Whitelist/blacklist ○ MAC filtering QoS Wireless settings <ul style="list-style-type: none"> ○ Encryption ○ Channels ○ QoS 	
2.4	<p>Compare and contrast wireless networking protocols.</p> <ul style="list-style-type: none"> 802.11a 802.11b 802.11g 802.11n 802.11ac Frequencies <ul style="list-style-type: none"> ○ 2.4Ghz ○ 5Ghz Channels <ul style="list-style-type: none"> ○ 1–11 Bluetooth NFC RFID Zigbee Z-Wave 3G 4G 5G LTE 	<p>7.1, 7.2, 7.3, 7.4 9.6 13.7</p>
2.5	<p>Summarize the properties and purposes of services provided by networked hosts.</p> <ul style="list-style-type: none"> Server roles <ul style="list-style-type: none"> ○ Web server ○ File server ○ Print server 	<p>4.5 6.2 7.1 13.6, 13.10, 13.11</p>

	<ul style="list-style-type: none"> ○ DHCP server ○ DNS server ○ Proxy server ○ Mail server ○ Authentication server ○ syslog <p>Internet appliance</p> <ul style="list-style-type: none"> ○ UTM ○ IDS ○ IPS ○ End-point management server <p>Legacy/embedded systems</p>	
2.6	<p>Explain common network configuration concepts.</p> <p>IP addressing</p> <ul style="list-style-type: none"> ○ Static ○ Dynamic ○ APIPA ○ Link local <p>DNS</p> <p>DHCP</p> <ul style="list-style-type: none"> ○ Reservations <p>IPv4 vs. IPv6</p> <p>Subnet mask</p> <p>Gateway</p> <p>VPN</p> <p>VLAN</p> <p>NAT</p>	<p>6.6, 6.7</p> <p>7.3</p> <p>9.6</p> <p>10.5</p> <p>13.12</p>
2.7	<p>Compare and contrast Internet connection types, network types, and their features.</p> <p>Internet connection types</p> <ul style="list-style-type: none"> ○ Cable ○ DSL ○ Dial-up ○ Fiber ○ Satellite ○ ISDN ○ Cellular - Tethering ○ Cellular - Mobile hotspot 	<p>6.1, 6.8</p>

	<ul style="list-style-type: none"> ○ Line-of-sight wireless Internet service <p>Network types</p> <ul style="list-style-type: none"> ○ LAN ○ WAN ○ PAN ○ MAN ○ WMN 	
2.8	<p>Given a scenario, use appropriate networking tools.</p> <p>Crimper Cable stripper Multimeter Tone generator and probe Cable tester Loopback plug Punchdown tool WiFi analyzer</p>	<p>6.10 7.5</p>
3.0	Hardware	
3.1	<p>Explain basic cable types, features, and their purposes.</p> <p>Network cables</p> <ul style="list-style-type: none"> ○ Ethernet - Cat 5 ○ Ethernet - Cat 5e ○ Ethernet - Cat 6 ○ Ethernet - Plenum ○ Ethernet - Shielded twisted pair ○ Ethernet - Unshielded twisted pair ○ Ethernet - 568A/B ○ Fiber ○ Coaxial ○ Speed and transmission limitations <p>Video cables</p> <ul style="list-style-type: none"> ○ VGA ○ HDMI ○ Mini-HDMI ○ DisplayPort ○ DVI ○ DVI-DDVI-I 	<p>1.2 3.12 4.2 5.1, 5.2 6.3, 6.4 9.6</p>

	<ul style="list-style-type: none"> Multipurpose cables <ul style="list-style-type: none"> ○ Lightning ○ Thunderbolt ○ USB ○ USB-C ○ USB 2.0 ○ USB 3.0 Peripheral cables <ul style="list-style-type: none"> ○ Serial Hard drive cables <ul style="list-style-type: none"> ○ SATA ○ IDE ○ SCSI Adapters <ul style="list-style-type: none"> ○ DVI to HDMI ○ USB to Ethernet ○ DVI to VGA 	
3.2	<p>Identify common connector types.</p> <ul style="list-style-type: none"> RJ-11 RJ-45 RS-232 BNC RG-59 RG-6 USB Micro-USB Mini-USB USB-C DB-9 Lightning SCSI eSATA Molex 	<p>1.2 3.2, 3.12 4.2 5.1, 5.2 6.3 9.6</p>
3.3	<p>Given a scenario, install RAM types.</p> <ul style="list-style-type: none"> RAM types <ul style="list-style-type: none"> ○ SODIMM ○ DDR2 	<p>3.7, 3.8</p>

	<ul style="list-style-type: none"> ○ DDR3 ○ DDR4 <p>Single channel Dual channel Triple channel Error correcting Parity vs. non-parity</p>	
3.4	<p>Given a scenario, select, install and configure storage devices.</p> <p>Optical drives</p> <ul style="list-style-type: none"> ○ CD-ROM/CD-RW ○ DVD-ROM/DVD-RW/DVD-RW DL ○ Blu-ray ○ BD-R ○ BD-RE <p>Solid-state drives</p> <ul style="list-style-type: none"> ○ M2 drives ○ NVME ○ SATA 2.5 <p>Magnetic hard drives</p> <ul style="list-style-type: none"> ○ 5,400rpm ○ 7,200rpm ○ 10,000rpm ○ 15,000rpm ○ Sizes - 2.5 ○ Sizes - 3.5 <p>Hybrid drives Hybrid drives</p> <p>Flash</p> <ul style="list-style-type: none"> ○ SD card ○ CompactFlash ○ Micro-SD card ○ Mini-SD card ○ xD <p>Configurations</p> <ul style="list-style-type: none"> ○ RAID 0, 1, 5, 10 ○ Hot swappable 	<p>3.3 4.5 5.1, 5.2, 5.3, 5.4, 5.9 9.1, 9.2</p>
3.5	<p>Given a scenario, install and configure motherboards, CPUs, and add-on cards.</p>	<p>3.1, 3.3, 3.5, 3.10, 3.11, 3.12, 3.13, 3.14</p>

	<ul style="list-style-type: none"> Motherboard form factor <ul style="list-style-type: none"> ○ ATX ○ mATX ○ ITX ○ mITX Motherboard connectors types <ul style="list-style-type: none"> ○ PCI ○ PCIe ○ Riser card ○ Socket types ○ SATA ○ IDE ○ Front panel connector ○ Internal USB connector BIOS/UEFI settings <ul style="list-style-type: none"> ○ Boot options ○ Firmware updates ○ Security settings ○ Interface configurations ○ Security - Passwords ○ Security - Drive encryption - TPM ○ Security - Drive encryption - LoJack ○ Security - Drive encryption - Secure boot CMOS battery CPU features <ul style="list-style-type: none"> ○ Single-core ○ Multicore ○ Virtual technology ○ Hyperthreading ○ Speeds ○ Overclocking ○ Integrated GPU Compatibility <ul style="list-style-type: none"> ○ AMD ○ Intel Cooling mechanism <ul style="list-style-type: none"> ○ Fans ○ Heat sink ○ Liquid ○ Thermal paste Expansion cards <ul style="list-style-type: none"> ○ Video cards - Onboard 	<p>4.2</p> <p>5.1, 5.2</p> <p>6.2</p> <p>9.2</p> <p>13.5</p>
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	<ul style="list-style-type: none"> ○ Video cards - Add-on card ○ Sound cards ○ Network interface card ○ USB expansion card ○ eSATA card 	
3.6	<p>Explain the purposes and uses of various peripheral types.</p> <p>Printer ADF/flatbed scanner Barcode scanner/QR scanner Monitors VR headset Optical DVD drive Mouse Keyboard Touchpad Signature pad Game controllers Camera/webcam Microphone Speakers Headset Projector</p> <ul style="list-style-type: none"> ○ Lumens/brightness <p>External storage drives KVM Magnetic reader/chip reader NFC/tap pay device Smart card reader External storage drives KVM Magnetic reader/chip reader NFC/tap pay device Smart card reader</p>	<p>1.2 3.12, 3.13 4.1, 4.2, 4.4 5.3 8.2 9.5 10.2 13.7</p>
3.7	<p>Summarize power supply types and features.</p> <p>Input 115V vs. 220V Output 5.5V vs. 12V</p>	<p>3.2</p>

	<p>24-pin motherboard adapter Wattage rating Number of devices/types of devices to be powered</p>	
3.8	<p>Given a scenario, select and configure appropriate components for a custom PC configuration to meet customer specifications or needs.</p> <ul style="list-style-type: none"> Graphic/CAD/CAM design workstation <ul style="list-style-type: none"> ○ Multicore processor ○ High-end video ○ Maximum RAM Audio/video editing workstation <ul style="list-style-type: none"> ○ Specialized audio and video card ○ Large, fast hard drive ○ Dual monitors Virtualization workstation <ul style="list-style-type: none"> ○ Maximum RAM and CPU cores Gaming PC <ul style="list-style-type: none"> ○ Multicore processor ○ High-end video/specialized GPU ○ High-definition sound card ○ High-end cooling Standard thick client <ul style="list-style-type: none"> ○ Desktop applications ○ Meets recommended requirements for selected OS Thin client <ul style="list-style-type: none"> ○ Basic applications ○ Meets minimum requirements for selected OS ○ Network connectivity Network attached storage device <ul style="list-style-type: none"> ○ Media streaming ○ File sharing ○ Gigabit NIC ○ RAID array 	10.1
3.9	<p>Given a scenario, install and configure common devices.</p> <ul style="list-style-type: none"> Desktop <ul style="list-style-type: none"> ○ Thin client ○ Thick client ○ Account setup/settings 	<p>7.1 9.2, 9.5, 9.6 10.1, 10.2 11.3</p>

	<p>Laptop/common mobile devices</p> <ul style="list-style-type: none"> ○ Touchpad configuration ○ Touchscreen configuration ○ Application installations/configurations ○ Synchronization settings ○ Account setup/settings ○ Wireless settings 	
3.10	<p>Given a scenario, configure SOHO multifunction devices/printers and settings.</p> <p>Use appropriate drivers for a given operating system</p> <ul style="list-style-type: none"> ○ Configuration settings - Duplex ○ Configuration settings - Collate ○ Configuration settings - Orientation ○ Configuration settings - Quality <p>Device sharing</p> <ul style="list-style-type: none"> ○ Wired - USB ○ Wired - Serial ○ Wired - Ethernet ○ Wireless - Bluetooth ○ Wireless - 802.11(a, b, g, n, ac) ○ Wireless - Infrastructure vs. ad hoc ○ Integrated print server (hardware) ○ Cloud printing/remote printing <p>Public/shared devices</p> <ul style="list-style-type: none"> ○ Sharing local/networked device via operating system settings - TCP/Bonjour/AirPrint ○ Data privacy - User authentication on the device ○ Data privacy - Hard drive caching 	8.2, 8.3, 8.4
3.11	<p>Given a scenario, install and maintain various print technologies.</p> <p>Laser</p> <ul style="list-style-type: none"> ○ Imaging drum, fuser assembly, transfer belt, transfer roller, pickup rollers, separate pads, duplexing assembly ○ Imaging process: processing, charging, exposing, developing, transferring, fusing, and cleaning ○ Maintenance: Replace toner, apply maintenance kit, calibrate, clean <p>Inkjet</p> <ul style="list-style-type: none"> ○ Ink cartridge, print head, roller, feeder, duplexing assembly, carriage, and belt ○ Calibrate ○ Maintenance: Clean heads, replace cartridges, calibrate, clear jams 	8.1, 8.2, 8.5

	<ul style="list-style-type: none"> Thermal <ul style="list-style-type: none"> ○ Feed assembly, heating element ○ Special thermal paper ○ Maintenance: Replace paper, clean heating element, remove debris Impact <ul style="list-style-type: none"> ○ Print head, ribbon, tractor feed ○ Impact paper ○ Maintenance: Replace ribbon, replace print head, replace paper Virtual <ul style="list-style-type: none"> ○ Print to file ○ Print to PDF ○ Print to XPS ○ Print to image 3D printers <ul style="list-style-type: none"> ○ Plastic filament 	
4.0	Virtualization and Cloud Computing	
4.1	<p>Compare and contrast cloud computing concepts.</p> <ul style="list-style-type: none"> Common cloud models <ul style="list-style-type: none"> ○ IaaS ○ SaaS ○ PaaS ○ Public vs. private vs. hybrid vs. community Shared resources <ul style="list-style-type: none"> ○ Internal vs. external Rapid elasticity On-demand Resource pooling Measured service Metered Off-site email applications Cloud file storage services <ul style="list-style-type: none"> ○ Synchronization apps Virtual application streaming/cloud-based applications <ul style="list-style-type: none"> ○ Applications for cell phones/tablets ○ Applications for laptops/desktops Virtual desktop <ul style="list-style-type: none"> ○ Virtual NIC 	10.5

4.2	<p>Given a scenario, set up and configure client-side virtualization.</p> <p>Purpose of virtual machines Resource requirements Emulator requirements Security requirements Network requirements Hypervisor</p>	10.5
5.0	Hardware and Network Troubleshooting	
5.1	<p>Given a scenario, use the best practice methodology to resolve problems.</p> <p>Always consider corporate policies, procedures, and impacts before implementing changes</p> <ol style="list-style-type: none"> 1. Identify the problem <ul style="list-style-type: none"> ○ Question the user and identify user changes to computer and perform backups before making changes ○ Inquire regarding environmental or infrastructure changes ○ Review system and application logs 2. Establish a theory of probable cause (question the obvious) <ul style="list-style-type: none"> ○ If necessary, conduct external or internal research based on symptoms 3. Test the theory to determine cause <ul style="list-style-type: none"> ○ Once the theory is confirmed, determine the next steps to resolve problem ○ If theory is not confirmed re-establish new theory or escalate 4. Establish a plan of action to resolve the problem and implement the solution 5. Verify full system functionality and, if applicable, implement preventive measures 6. Document findings, actions, and outcomes 	2.6
5.2	<p>Given a scenario, troubleshoot problems related to motherboards, RAM, CPUs, and power.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Unexpected shutdowns ○ System lockups ○ POST code beeps ○ Blank screen on bootup ○ BIOS time and setting resets ○ Attempts to boot to incorrect device ○ Continuous reboots ○ No power ○ Overheating 	3.4, 3.9

	<ul style="list-style-type: none"> ○ Loud noise ○ Intermittent device failure ○ Fans spin – no power to other devices ○ Indicator lights ○ Smoke ○ Burning smell ○ Proprietary crash screens (BSOD/pin wheel) ○ Distended capacitors ○ Log entries and error messages 	
5.3	<p>Given a scenario, troubleshoot hard drives and RAID arrays.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Read/write failure ○ Slow performance ○ Loud clicking noise ○ Failure to boot ○ Drive not recognized ○ OS not found ○ RAID not found ○ RAID stops working ○ Proprietary crash screens (BSOD/pin wheel) ○ S.M.A.R.T. errors 	5.10
5.4	<p>Given a scenario, troubleshoot video, projector, and display issues.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ VGA mode ○ No image on screen ○ Overheat shutdown ○ Dead pixels ○ Artifacts ○ Incorrect color patterns ○ Dim image ○ Flickering image ○ Distorted image ○ Distorted geometry ○ Burn-in ○ Oversized images and icons ○ Multiple failed jobs in logs 	4.4

5.5	<p>Given a scenario, troubleshoot common mobile device issues while adhering to the appropriate procedures.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ No display ○ Dim display ○ Flickering display ○ Sticking keys ○ Intermittent wireless ○ Battery not charging ○ Ghost cursor/pointer drift ○ No power ○ Num lock indicator lights ○ No wireless connectivity ○ No Bluetooth connectivity ○ Cannot display to external monitor ○ Touchscreen non-responsive ○ Apps not loading ○ Slow performance ○ Unable to decrypt email ○ Extremely short battery life ○ Overheating ○ Frozen system ○ No sound from speakers ○ GPS not functioning ○ Swollen battery <p>Disassembling processes for proper reassembly</p> <ul style="list-style-type: none"> ○ Document and label cable and screw locations ○ Organize parts ○ Refer to manufacturer resources ○ Use appropriate hand tools 	9.2, 9.4, 9.8
5.6	<p>Given a scenario, troubleshoot printers.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Streaks ○ Faded prints ○ Ghost images ○ Toner not fused to the paper ○ Creased paper ○ Paper not feeding ○ Paper jam ○ No connectivity 	8.6

	<ul style="list-style-type: none"> ○ Garbled characters on paper ○ Vertical lines on page ○ Backed-up print queue ○ Low memory errors ○ Access denied ○ Printer will not print ○ Color prints in wrong print color ○ Unable to install printer ○ Error codes ○ Printing blank pages ○ No image on printer display 	
5.7	<p>Given a scenario, troubleshoot common wired and wireless network problems.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Limited connectivity ○ Unavailable resources - Internet ○ Unavailable resources - Local resources - Shares ○ Unavailable resources - Local resources - Printers ○ Unavailable resources - Local resources - Email ○ No connectivity ○ APIPA/link local address ○ Intermittent connectivity ○ IP conflict ○ Slow transfer speeds ○ Low RF signal ○ SSID not found ○ Unavailable resources - Internet ○ Unavailable resources - Local resources - Shares ○ Unavailable resources - Local resources - Printers ○ Unavailable resources - Local resources - Email ○ No connectivity ○ APIPA/link local address ○ Intermittent connectivity ○ IP conflict ○ Slow transfer speeds ○ Low RF signal ○ SSID not found 	6.9, 6.10 7.5

Objective Mapping: LabSim Section to CompTIA 220-1002 Objectives

The TestOut PC Pro course covers the following CompTIA A+ Certification 220-1002 exam objectives:

Section	Title	Objectives
1.0	Computing Overview	
1.1	Course Introduction	
1.2	Hardware Basics	
1.3	Windows Basics	1.1 Compare and contrast common operating system types and their purposes. Workstation operating systems <ul style="list-style-type: none"> ○ Microsoft Windows
1.4	Linux Basics	1.1 Compare and contrast common operating system types and their purposes. Workstation operating systems <ul style="list-style-type: none"> ○ Linux 1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems. Tools <ul style="list-style-type: none"> ○ Shell/Terminal Basic Linux commands <ul style="list-style-type: none"> ○ ls ○ cd ○ shutdown ○ pwd vs. passwd ○ mv ○ cp ○ rm ○ iwconfig/ifconfig ○ su/sudo

		<ul style="list-style-type: none"> ○ dd <p>4.8 Identify the basics of scripting.</p> <p>Environment variables</p>
1.5	macOS Basics	<p>1.1 Compare and contrast common operating system types and their purposes.</p> <p>Workstation operating systems</p> <ul style="list-style-type: none"> ○ Apple Macintosh OS <p>1.3 Summarize general OS installation considerations and upgrade methods.</p> <p>File system types/formatting</p> <ul style="list-style-type: none"> ○ HFS <p>1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p>Features</p> <ul style="list-style-type: none"> ○ Multiple desktops/Mission Control ○ Key Chain ○ Spot Light ○ iCloud ○ Gestures ○ Finder ○ Remote Disc ○ Dock ○ Boot Camp
2.0	PC Technician Responsibilities	
2.1	Protection and Safety	<p>4.4 Explain common safety procedures.</p> <p>Equipment grounding</p> <p>Proper component handling and storage</p> <ul style="list-style-type: none"> ○ Antistatic bags ○ ESD straps ○ ESD mats ○ Self-grounding

		<p>Toxic waste handling</p> <ul style="list-style-type: none"> ○ Batteries ○ Toner ○ CRT ○ Cell phones ○ Tablets <p>Personal safety</p> <ul style="list-style-type: none"> ○ Disconnect power before repairing PC ○ Remove jewelry ○ Lifting techniques ○ Weight limitations ○ Electrical fire safety ○ Cable management ○ Safety goggles ○ Air filter mask <p>Compliance with government regulations</p> <p>4.5 Explain environmental impacts and appropriate controls.</p> <p>MSDS documentation for handling and disposal Temperature, humidity level awareness, and proper ventilation Protection from airborne particles</p> <ul style="list-style-type: none"> ○ Enclosures ○ Air filters/mask <p>Dust and debris</p> <ul style="list-style-type: none"> ○ Compressed air ○ Vacuums <p>Compliance to government regulations</p>
2.2	Professionalism	<p>4.7 Given a scenario, use proper communication techniques and professionalism.</p> <p>Use proper language and avoid jargon, acronyms, and slang, when applicable Maintain a positive attitude/project confidence Actively listen (taking notes) and avoid interrupting the customer Be culturally sensitive</p> <ul style="list-style-type: none"> ○ Use appropriate professional titles, when applicable <p>Be on time (if late, contact the customer) Avoid distractions</p> <ul style="list-style-type: none"> ○ Personal calls ○ Texting/social media sites ○ Talking to coworkers while interacting with customers ○ Personal interruptions

		<p>Dealing with difficult customers or situations</p> <ul style="list-style-type: none"> ○ Do not argue with customers and/or be defensive ○ Avoid dismissing customer problems ○ Avoid being judgmental ○ Clarify customer statements (ask open-ended questions to narrow the scope of the problem, restate the issue, or question to verify understanding) ○ Do not disclose experiences via social media outlets <p>Set and meet expectations/timeline and communicate status with the customer</p> <ul style="list-style-type: none"> ○ Offer different repair/replacement options, if applicable ○ Provide proper documentation on the services provided ○ Follow up with customer/user at a later date to verify satisfaction <p>Deal appropriately with customers' confidential and private materials</p> <ul style="list-style-type: none"> ○ Located on a computer, desktop, printer, etc.
2.3	Change Management	<p>4.2 Given a scenario, implement basic change management best practices.</p> <p>Documented business processes Purpose of the change Scope the change Risk analysis Plan for change End-user acceptance Change board</p> <ul style="list-style-type: none"> ○ Approvals <p>Backout plan Document changes</p>
2.4	PC Tools	
2.5	PC Maintenance	<p>4.3 Given a scenario, implement basic disaster prevention and recovery methods.</p> <p>UPS Surge protector</p> <p>4.5 Explain environmental impacts and appropriate controls.</p> <p>Power surges, brownouts, and blackouts</p> <ul style="list-style-type: none"> ○ Battery backup ○ Surge suppressor

2.6	Troubleshooting Process Overview	4.1 Compare and contrast best practices associated with types of documentation. Network topology diagrams Knowledge base/articles
3.0	System Components	
3.1	Cases and Form Factors	
3.2	Power Supplies	
3.3	Motherboards and Buses	
3.4	Motherboard Troubleshooting	
3.5	Processors	1.1 Compare and contrast common operating system types and their purposes. 32-bit vs. 64-bit <ul style="list-style-type: none"> ○ RAM limitations ○ Software compatibility
3.6	Processor Troubleshooting	
3.7	Memory	1.7 Summarize application installation and configuration concepts. System requirements <ul style="list-style-type: none"> ○ RAM
3.8	Memory Installation	
3.9	Memory Troubleshooting	1.5 Given a scenario, use Microsoft operating system features and tools. Administrative <ul style="list-style-type: none"> ○ Windows Memory Diagnostics
3.10	BIOS/UEFI	
3.11	Expansion Cards	
3.12	Video	

3.13	Audio	1.6 Given a scenario, use Microsoft Windows Control Panel utilities. Sound
3.14	Cooling	
4.0	Peripheral Devices	
4.1	Peripheral Devices	4.1 Compare and contrast best practices associated with types of documentation. Inventory management <ul style="list-style-type: none"> ○ Barcodes
4.2	USB	
4.3	Display Devices	1.6 Given a scenario, use Microsoft Windows Control Panel utilities. Display/Display Settings <ul style="list-style-type: none"> ○ Resolution ○ Color depth ○ Refresh rate
4.4	Video Troubleshooting	
4.5	Device Driver Management	1.5 Given a scenario, use Microsoft operating system features and tools. Administrative <ul style="list-style-type: none"> ○ Computer Management ○ Device Manager ○ Local Users and Groups ○ Local Security Policy ○ Performance Monitor ○ Services ○ System Configuration ○ Task Scheduler ○ Component Services ○ Data Sources ○ Print Management ○ Windows Memory Diagnostics ○ Windows Firewall

		<ul style="list-style-type: none"> ○ Advanced Security <p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>Device Manager</p> <p>1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p>Best practices</p> <ul style="list-style-type: none"> ○ Driver/firmware updates
4.6	Device Driver Troubleshooting	<p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>Administrative</p> <ul style="list-style-type: none"> ○ Computer Management ○ Device Manager ○ Local Users and Groups ○ Local Security Policy ○ Performance Monitor ○ Services ○ System Configuration ○ Task Scheduler ○ Component Services ○ Data Sources ○ Print Management ○ Windows Memory Diagnostics ○ Windows Firewall ○ Advanced Security <p>3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common solutions</p> <ul style="list-style-type: none"> ○ Roll back updates ○ Roll back devices drivers
5.0	Storage	
5.1	Storage Devices	

5.2	SATA	
5.3	Optical Media	
5.4	RAID	
5.5	File Systems	<p>1.3 Summarize general OS installation considerations and upgrade methods.</p> <p>Partitioning</p> <ul style="list-style-type: none"> ○ Dynamic ○ Basic ○ Primary ○ Extended ○ Logical ○ GPT <p>File system types/formatting</p> <ul style="list-style-type: none"> ○ ExFAT ○ FAT32 ○ NTFS ○ CDFS ○ NFS ○ ext3, ext4 ○ Quick format vs. full format
5.6	File System Creation	<p>1.3 Summarize general OS installation considerations and upgrade methods.</p> <p>Partitioning</p> <ul style="list-style-type: none"> ○ Dynamic ○ Basic ○ Primary ○ Extended ○ Logical <p>1.4 Given a scenario, use appropriate Microsoft command line tools.</p> <p>diskpart gpupdate format</p> <p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>Disk Management</p>

		<ul style="list-style-type: none"> ○ Drive status ○ Mounting ○ Initializing ○ Extending partitions ○ Splitting partitions ○ Shrink partitions ○ Assigning/changing drive letters ○ Adding drives ○ Adding arrays ○ Storage spaces <p>1.7 Summarize application installation and configuration concepts.</p> <p>System requirements</p> <ul style="list-style-type: none"> ○ RAM
5.7	Storage Management	<p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>Disk Management</p> <ul style="list-style-type: none"> ○ Drive status ○ Mounting ○ Initializing ○ Extending partitions ○ Splitting partitions ○ Shrink partitions ○ Assigning/changing drive letters ○ Adding drives ○ Adding arrays ○ Storage spaces
5.8	Storage Spaces	<p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>Disk Management</p> <ul style="list-style-type: none"> ○ Drive status ○ Mounting ○ Initializing ○ Extending partitions ○ Splitting partitions ○ Shrink partitions ○ Assigning/changing drive letters ○ Adding drives

		<ul style="list-style-type: none"> ○ Adding arrays ○ Storage spaces
5.9	Disk Optimization	<p>1.4 Given a scenario, use appropriate Microsoft command line tools.</p> <p style="padding-left: 40px;">chkdsk</p> <p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p style="padding-left: 40px;">System utilities</p> <ul style="list-style-type: none"> ○ Regedit ○ Msinfo32 ○ DxDiag ○ Disk Defragmenter
5.10	Storage Troubleshooting	
6.0	Networking	
6.1	Networking Overview	
6.2	Network Hardware	<p>1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.</p> <p style="padding-left: 40px;">Network card properties</p> <ul style="list-style-type: none"> ○ Half duplex/full duplex/auto ○ Speed ○ Wake-on-LAN ○ QoS ○ BIOS (on-board NIC)
6.3	Networking Media	
6.4	Ethernet	<p>1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.</p> <p style="padding-left: 40px;">Establish networking connections</p> <ul style="list-style-type: none"> ○ WWAN (Cellular)
6.5	IP Networking	4.9 Given a scenario, use remote access technologies.

		RDP Telnet SSH Third-party tools <ul style="list-style-type: none"> ○ File share
6.6	IP Configuration	1.6 Given a scenario, use Microsoft Windows Control Panel utilities. Network and Sharing Center 1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop. Configuring an alternative IP address in Windows <ul style="list-style-type: none"> ○ IP addressing ○ Subnet mask ○ DNS ○ Gateway
6.7	IP Version 6	
6.8	Internet Connectivity	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop. Establish networking connections <ul style="list-style-type: none"> ○ Dial-ups ○ Wired
6.9	Network Utilities	1.4 Given a scenario, use appropriate Microsoft command line tools. ipconfig ping tracert netstat nslookup 1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems. Basic Linux commands

		<ul style="list-style-type: none"> ○ iwconfig/ifconfig <p>2.5 Compare and contrast social engineering, threats, and vulnerabilities.</p> <p>DoS</p>
6.10	Network Troubleshooting	<p>3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common solutions</p> <ul style="list-style-type: none"> ○ Update network settings
7.0	Wireless Networking	
7.1	802.11 Wireless	<p>1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.</p> <p>Establish networking connections</p> <ul style="list-style-type: none"> ○ Wireless <p>2.2 Explain logical security concepts.</p> <p>Certificates</p> <p>2.3 Compare and contrast wireless security protocols and authentication methods.</p> <p>Protocols and encryption</p> <ul style="list-style-type: none"> ○ WEP ○ WPA ○ WPA2 ○ TKIP ○ AES <p>Authentication</p> <ul style="list-style-type: none"> ○ RADIUS ○ TACACS
7.2	Infrared, Bluetooth, and NFC	
7.3	SOHO Configuration	
7.4	Internet of Things	

7.5	Wireless Network Troubleshooting	<p>3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Limited connectivity <p>Common solutions</p> <ul style="list-style-type: none"> ○ Update network settings
8.0	Printing	
8.1	Printers	
8.2	Printer Configuration	<p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>Devices and Printers</p>
8.3	Network Printing	<p>1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.</p> <p>Printer sharing vs. network printer mapping</p>
8.4	Printing Management	<p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>Administrative</p> <ul style="list-style-type: none"> ○ Computer Management ○ Device Manager ○ Local Users and Groups ○ Local Security Policy ○ Performance Monitor ○ Services ○ System Configuration ○ Task Scheduler ○ Component Services ○ Data Sources ○ Print Management ○ Windows Memory Diagnostics ○ Windows Firewall ○ Advanced Security
8.5	Printer Maintenance	

8.6	Printer Troubleshooting	<p>3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Printing issues
9.0	Mobile Devices	
9.1	Laptops	
9.2	Laptop Components	
9.3	Laptop Power Management	<p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>Power Options</p> <ul style="list-style-type: none"> ○ Hibernate ○ Power plans ○ Sleep/suspend ○ Standby
9.4	Laptop Troubleshooting	
9.5	Mobile Devices	<p>1.1 Compare and contrast common operating system types and their purposes.</p> <p>Cell phone/tablet operating systems</p> <ul style="list-style-type: none"> ○ Microsoft Windows ○ Android ○ iOS ○ Chrome OS
9.6	Mobile Device Networking	
9.7	Mobile Device Security	<p>2.2 Explain logical security concepts.</p> <p>MDM policies</p> <p>2.8 Given a scenario, implement methods for securing mobile devices.</p> <p>Screen locks</p> <ul style="list-style-type: none"> ○ Fingerprint lock ○ Face lock ○ Swipe lock

		<ul style="list-style-type: none"> ○ Passcode lock Remote wipes Locator applications Remote backup applications Failed login attempts restrictions Antivirus/Anti-malware Patching/OS updates Biometric authentication Full device encryption Multifactor authentication Authenticator applications Trusted sources vs. untrusted sources Firewalls Policies and procedures <ul style="list-style-type: none"> ○ BYOD vs. corporate-owned ○ Profile security requirements <p>3.5 Given a scenario, troubleshoot mobile OS and application security issues.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Signal drop/weak signal ○ Power drain ○ Slow data speeds ○ Unintended WiFi connection ○ Unintended Bluetooth pairing ○ Leaked personal files/data ○ Data transmission over limit ○ Unauthorized account access ○ Unauthorized location tracking ○ Unauthorized camera/microphone activation ○ High resource utilization <p>4.3 Given a scenario, implement basic disaster prevention and recovery methods.</p> <p>Cloud storage vs. local storage backups</p>
9.8	Mobile Device Troubleshooting	<p>3.4 Given a scenario, troubleshoot mobile OS and application issues.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Dim display ○ Intermittent wireless

		<ul style="list-style-type: none"> ○ No wireless connectivity ○ No Bluetooth connectivity ○ Cannot broadcast to external monitor ○ Touchscreen non-responsive ○ Apps not loading ○ Slow performance ○ Unable to decrypt email ○ Extremely short battery life ○ Overheating ○ Frozen system ○ No sound from speakers ○ Inaccurate touch screen response ○ System lockout ○ App log errors <p>3.5 Given a scenario, troubleshoot mobile OS and application security issues.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Slow data speeds ○ Data transmission over limit ○ High resource utilization
10.0	System Implementation	
10.1	Component Selection	
10.2	Windows Pre-Installation	<p>1.1 Compare and contrast common operating system types and their purposes.</p> <p>Workstation operating systems</p> <ul style="list-style-type: none"> ○ Microsoft Windows ○ Apple Macintosh OS ○ Linux <p>Compatibility concerns between operating systems</p> <p>1.2 Compare and contrast features of Microsoft Windows versions.</p> <p>Windows 7 Windows 8 Windows 8.1 Windows 10 Corporate vs. personal needs</p> <ul style="list-style-type: none"> ○ Domain access

- Media center
 - Branchcache
- Desktop styles/user interface

1.3 Summarize general OS installation considerations and upgrade methods.

Type of installations

- Unattended installation
- In-place upgrade
- Clean install
- Repair installation
- Multiboot
- Remote network installation
- Image deployment
- Recovery partition
- Refresh/restore

Properly formatted boot drive with the correct partitions/format
Prerequisites/hardware compatibility
OS compatibility/upgrade path

1.6 Given a scenario, use Microsoft Windows Control Panel utilities.

HomeGroup

1.7 Summarize application installation and configuration concepts.

OS requirements

- Compatibility

Methods of installation and deployment

- Local (CD/USB)
- Network-based

1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.

HomeGroup vs. Workgroup
Domain setup

3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.

Common solutions

		<ul style="list-style-type: none"> ○ Rebuild Windows profiles <p>4.3 Given a scenario, implement basic disaster prevention and recovery methods.</p> <p>Account recovery options</p>
10.3	Windows Installation	<p>1.3 Summarize general OS installation considerations and upgrade methods.</p> <p>Boot methods</p> <ul style="list-style-type: none"> ○ USB ○ CD-ROM ○ DVD ○ PXE ○ Solid state/flash drives ○ Netboot ○ External/hot-swappable drive ○ Internal hard drive (partition) <p>Load alternate third-party drivers when necessary Time/date/region/language settings Driver installation, software, and Windows updates Factory recovery partition Properly formatted boot drive with the correct partitions/format</p> <p>1.4 Given a scenario, use appropriate Microsoft command line tools.</p> <p>dism</p> <p>1.7 Summarize application installation and configuration concepts.</p> <p>Methods of installation and deployment</p> <ul style="list-style-type: none"> ○ Local (CD/USB) ○ Network-based
10.4	Post-Installation	
10.5	Virtualization	
11.0	File Management	

11.1	Windows File Locations	<p>2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings.</p> <p>System files and folders</p> <p>4.8 Identify the basics of scripting.</p> <p>Environment variables</p>
11.2	Manage Files on Windows	<p>1.4 Given a scenario, use appropriate Microsoft command line tools.</p> <p>Navigation</p> <ul style="list-style-type: none"> ipconfig nslookup copy xcopy robocopy <p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>Folder Options</p> <ul style="list-style-type: none"> ○ View hidden files ○ Hide extensions ○ General options ○ View options <p>2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings.</p> <p>NTFS vs. share permissions</p> <ul style="list-style-type: none"> ○ Allow vs. deny ○ Moving vs. copying folders and files ○ File attributes <p>4.8 Identify the basics of scripting.</p> <p>Script file types</p> <ul style="list-style-type: none"> ○ .bat ○ .ps1 ○ .vbs ○ .sh ○ .py

		<ul style="list-style-type: none"> ○ .js <p>Comment syntax</p> <p>Basic script constructs</p> <ul style="list-style-type: none"> ○ Basic loops ○ Variables <p>Basic data types</p> <ul style="list-style-type: none"> ○ Integers ○ Strings
11.3	NTFS Permissions	<p>1.7 Summarize application installation and configuration concepts.</p> <p>Local user permissions</p> <ul style="list-style-type: none"> ○ Folder/file access for installation <p>2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings.</p> <p>NTFS vs. share permissions</p> <ul style="list-style-type: none"> ○ Allow vs. deny ○ Moving vs. copying folders and files ○ File attributes
11.4	Shared Folders	<p>1.3 Summarize general OS installation considerations and upgrade methods.</p> <p>Workgroup vs. Domain setup</p> <p>1.4 Given a scenario, use appropriate Microsoft command line tools.</p> <p>net use</p> <p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>System utilities</p> <ul style="list-style-type: none"> ○ Regedit ○ Msinfo32 ○ DxDiag ○ Disk Defragmenter <p>1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.</p>

		<p>Network shares/administrative shares/mapping drives</p> <p>2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings.</p> <p>Shared files and folders</p> <ul style="list-style-type: none"> ○ Administrative shares vs. local shares ○ Permission propagation ○ Inheritance <p>4.9 Given a scenario, use remote access technologies.</p> <p>Third-party tools</p> <ul style="list-style-type: none"> ○ File share
11.5	Linux File Management	<p>1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p>Basic Linux commands</p> <ul style="list-style-type: none"> ○ ls ○ grep ○ cd ○ shutdown ○ pwd vs. passwd ○ mv ○ cp ○ rm ○ chmod ○ chown ○ vi ○ dd
12.0	System Management	
12.1	Windows System Tools	<p>1.4 Given a scenario, use appropriate Microsoft command line tools.</p> <p>shutdown taskkill gpupdate gpresult [command name] /?</p>

Commands available with standard privileges vs. administrative privileges

1.5 Given a scenario, use Microsoft operating system features and tools.

Administrative

- Computer Management
- Device Manager
- Local Users and Groups
- Local Security Policy
- Performance Monitor
- Services
- System Configuration
- Task Scheduler
- Component Services
- Data Sources
- Print Management
- Windows Memory Diagnostics
- Windows Firewall
- Advanced Security
- Event Viewer
- User Account Management

MSConfig

- General
- Boot
- Services
- Startup
- Tools

Task Manager

- Applications
- Processes
- Performance
- Networking
- Users

System utilities

- Regedit
- Command
- Services.msc
- MMC
- MSTSC
- Notepad
- Explorer
- Msinfo32
- DxDiag

- Disk Defragmenter
- System Restore
- Windows Update

1.6 Given a scenario, use Microsoft Windows Control Panel utilities.

Troubleshooting
Sync Center

1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.

Basic Linux commands

- kill

2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings.

Run as administrator vs. standard user

2.7 Given a scenario, implement security best practices to secure a workstation.

Account management

- Timeout/screen lock

3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.

- Common symptoms
- Services fail to start
- Common solutions
- Kill tasks
 - Disable application startup

4.8 Identify the basics of scripting.

Environment variables

12.2	Preferences and Settings	
12.3	Performance Monitoring	1.5 Given a scenario, use Microsoft operating system features and tools.

		<p>Administrative</p> <ul style="list-style-type: none"> ○ Computer Management ○ Device Manager ○ Local Users and Groups ○ Local Security Policy ○ Performance Monitor ○ Services ○ System Configuration ○ Task Scheduler ○ Component Services ○ Data Sources ○ Print Management ○ Windows Memory Diagnostics ○ Windows Firewall ○ Advanced Security
12.4	Active Directory	<p>2.2 Explain logical security concepts.</p> <p>Active Directory</p> <ul style="list-style-type: none"> ○ Login script ○ Domain ○ Group Policy/Updates ○ Organizational Units ○ Home Folder ○ Folder redirection <p>2.7 Given a scenario, implement security best practices to secure a workstation.</p> <p>Account management</p> <ul style="list-style-type: none"> ○ Basic Active Directory functions - Account creation ○ Basic Active Directory functions - Account deletion ○ Basic Active Directory functions - Password reset/unlock account ○ Basic Active Directory functions - Disable account
12.5	Users and Groups	<p>1.4 Given a scenario, use appropriate Microsoft command line tools.</p> <p>net user</p> <p>1.5 Given a scenario, use Microsoft operating system features and tools.</p>

Administrative

- Computer Management
- Device Manager
- Local Users and Groups
- Local Security Policy
- Performance Monitor
- Services
- System Configuration
- Task Scheduler
- Component Services
- Data Sources
- Print Management
- Windows Memory Diagnostics
- Windows Firewall
- Advanced Security
- User Account Management

1.6 Given a scenario, use Microsoft Windows Control Panel utilities.

User Accounts

2.2 Explain logical security concepts.

Active Directory

- Domain
- Group Policy/Updates

2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings.

User and groups

- Administrator
- Power user
- Guest
- Standard user

2.7 Given a scenario, implement security best practices to secure a workstation.

Account management

- Restricting user permissions
- Logon time restrictions
- Disabling guest account
- Basic Active Directory functions - Account creation

		<ul style="list-style-type: none"> ○ Basic Active Directory functions - Account deletion ○ Basic Active Directory functions - Disable account
12.6	Remote Services	<p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>System</p> <ul style="list-style-type: none"> ○ Performance (virtual memory) ○ Remote settings ○ System protection <p>1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.</p> <p>Remote Desktop Connection Remote Assistance</p> <p>1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p>Tools</p> <ul style="list-style-type: none"> ○ Screen sharing <p>4.9 Given a scenario, use remote access technologies.</p> <p>Third-party tools</p> <ul style="list-style-type: none"> ○ Screen share feature <p>Security considerations of each access method</p>
12.7	Windows Application Management	<p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>Administrative</p> <ul style="list-style-type: none"> ○ Computer Management ○ Device Manager ○ Local Users and Groups ○ Local Security Policy ○ Performance Monitor ○ Services ○ System Configuration ○ Task Scheduler ○ Component Services ○ Data Sources

		<ul style="list-style-type: none"> ○ Print Management ○ Windows Memory Diagnostics ○ Windows Firewall ○ Advanced Security <p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>Programs and features</p>
12.8	Linux Application Management	<p>1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p>Tools</p> <ul style="list-style-type: none"> ○ Force Quit <p>Basic Linux commands</p> <ul style="list-style-type: none"> ○ ps ○ su/sudo ○ apt-get ○ kill
12.9	Digital Content Management	<p>4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.</p> <p>Licensing/DRM/EULA</p> <ul style="list-style-type: none"> ○ Open-source vs. commercial license ○ Personal license vs. enterprise licenses
12.10	Updates	<p>1.1 Compare and contrast common operating system types and their purposes.</p> <p>Vendor-specific limitations</p> <ul style="list-style-type: none"> ○ End-of-life ○ Update limitations <p>1.3 Summarize general OS installation considerations and upgrade methods.</p> <p>OS compatibility/upgrade path</p> <p>1.5 Given a scenario, use Microsoft operating system features and tools.</p>

		<p>System utilities</p> <ul style="list-style-type: none"> ○ Regedit ○ Command ○ Services.msc ○ MMC ○ MSTSC ○ Notepad ○ Explorer ○ Msinfo32 ○ DxDiag ○ Disk Defragmenter ○ System Restore ○ Windows Update <p>1.7 Summarize application installation and configuration concepts.</p> <p>OS requirements</p> <ul style="list-style-type: none"> ○ Compatibility <p>1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p>Best practices</p> <ul style="list-style-type: none"> ○ System updates/App Store ○ Patch management <p>2.7 Given a scenario, implement security best practices to secure a workstation.</p> <p>Patch/update management</p>
12.11	System Backup	<p>1.3 Summarize general OS installation considerations and upgrade methods.</p> <p>File system types/formatting</p> <ul style="list-style-type: none"> ○ HFS <p>1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p>Best practices</p> <ul style="list-style-type: none"> ○ Scheduled backups

		<p>Tools</p> <ul style="list-style-type: none"> ○ Backup/Time Machine ○ Restore/Snapshot <p>3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common solutions</p> <ul style="list-style-type: none"> ○ Rebuild Windows profiles <p>4.3 Given a scenario, implement basic disaster prevention and recovery methods.</p> <p>Backup and recovery</p> <ul style="list-style-type: none"> ○ Image level ○ File level ○ Critical applications <p>Backup testing</p>
12.12	System Recovery	<p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>System utilities</p> <ul style="list-style-type: none"> ○ Regedit ○ Command ○ Services.msc ○ MMC ○ MSTSC ○ Notepad ○ Explorer ○ Msinfo32 ○ DxDiag ○ Disk Defragmenter ○ System Restore ○ Windows Update <p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>System</p> <ul style="list-style-type: none"> ○ Performance (virtual memory) ○ Remote settings ○ System protection

		<p>1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p>Tools</p> <ul style="list-style-type: none"> ○ Restore/Snapshot ○ Image recovery <p>3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common solutions</p> <ul style="list-style-type: none"> ○ Disable Windows services/applications ○ Rebuild Windows profiles
12.13	Virtual Memory	<p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>System</p> <ul style="list-style-type: none"> ○ Performance (virtual memory) ○ Remote settings ○ System protection
12.14	Operating System Troubleshooting	<p>1.3 Summarize general OS installation considerations and upgrade methods.</p> <p>Application compatibility</p> <p>3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Black screens ○ Slow profile load <p>Common solutions</p> <ul style="list-style-type: none"> ○ Apply updates ○ Repair application <p>3.2 Given a scenario, troubleshoot and resolve PC security issues.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ System/application log errors

		<p>4.8 Identify the basics of scripting.</p> <p>Environment variables</p>
12.15	Windows Boot Errors	<p>1.4 Given a scenario, use appropriate Microsoft command line tools.</p> <p>sfc</p> <p>3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common solutions</p> <ul style="list-style-type: none"> ○ Reboot ○ Update boot order
13.0	Security	
13.1	Security Best Practices	<p>2.2 Explain logical security concepts.</p> <p>Trusted/untrusted software sources Principle of least privilege</p> <p>2.7 Given a scenario, implement security best practices to secure a workstation.</p> <p>Password best practices</p> <ul style="list-style-type: none"> ○ Setting strong passwords ○ Password expiration ○ Screensaver required password ○ BIOS/UEFI passwords ○ Requiring passwords <p>Account management</p> <ul style="list-style-type: none"> ○ Change default admin user account/password <p>Disable autorun</p> <p>4.1 Compare and contrast best practices associated with types of documentation.</p> <p>Acceptable use policy Password policy</p>

		<p>4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.</p> <p>Follow all policies and security best practices</p>
13.2	Incident Response	<p>1.3 Summarize general OS installation considerations and upgrade methods.</p> <p>File system types/formatting</p> <ul style="list-style-type: none"> ○ Swap partition <p>4.1 Compare and contrast best practices associated with types of documentation.</p> <p>Incident documentation Regulatory and compliance policy</p> <p>4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.</p> <p>Incident response</p> <ul style="list-style-type: none"> ○ First response - Identify ○ First response - Report through proper channels ○ First response - Data/device preservation ○ Use of documentation/documentation changes ○ Chain of custody - Tracking of evidence/documenting process
13.3	Physical Security	<p>2.1 Summarize the importance of physical security measures.</p> <p>Mantrap Badge reader Smart card Security guard Door lock Biometric locks Hardware tokens Cable locks Server locks USB locks Privacy screen Key fobs</p>

		<p>Entry control roster</p> <p>2.2 Explain logical security concepts.</p> <p>DLP Access control lists</p> <p>2.7 Given a scenario, implement security best practices to secure a workstation.</p> <p>Password best practices</p> <ul style="list-style-type: none"> ○ Screensaver required password <p>2.9 Given a scenario, implement appropriate data destruction and disposal methods.</p> <p>Physical destruction</p> <ul style="list-style-type: none"> ○ Shredder ○ Drill/hammer ○ Electromagnetic (Degaussing) ○ Incineration ○ Certificate of destruction <p>Recycling or repurposing best practices</p> <ul style="list-style-type: none"> ○ Low-level format vs. standard format ○ Overwrite ○ Drive wipe <p>4.1 Compare and contrast best practices associated with types of documentation.</p> <p>Regulatory and compliance policy Inventory management</p> <ul style="list-style-type: none"> ○ Asset tags
13.4	Social Engineering	<p>4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.</p> <p>Regulated data</p> <ul style="list-style-type: none"> ○ PII ○ PCI ○ GDPR ○ PHI

13.5	BIOS/UEFI Security	<p>2.7 Given a scenario, implement security best practices to secure a workstation.</p> <p> Password best practices</p> <ul style="list-style-type: none"> ○ Setting strong passwords ○ Password expiration ○ Screensaver required password ○ BIOS/UEFI passwords ○ Requiring passwords
13.6	Malware Protection	<p>1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p> Best practices</p> <ul style="list-style-type: none"> ○ Antivirus/Anti-malware updates <p>2.2 Explain logical security concepts.</p> <p> Antivirus/Anti-malware</p> <p>2.4 Given a scenario, detect, remove, and prevent malware using appropriate tools and methods.</p> <p> Malware</p> <ul style="list-style-type: none"> ○ Ransomware ○ Trojan ○ Keylogger ○ Rootkit ○ Virus ○ Botnet ○ Worm ○ Spyware <p>2.5 Compare and contrast social engineering, threats, and vulnerabilities.</p> <p> Social engineering</p> <ul style="list-style-type: none"> ○ Phishing ○ Spear phishing ○ Impersonation ○ Shoulder surfing ○ Tailgating ○ Dumpster diving <p> DDoS</p>

		<p>DoS Zero-day Man-in-the-middle Brute force Dictionary Rainbow table Spoofing Non-compliant systems Zombie</p> <p>3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common solutions</p> <ul style="list-style-type: none"> ○ Reimage/reload OS <p>3.3 Given a scenario, use best practice procedures for malware removal.</p> <ol style="list-style-type: none"> 1. Identify and research malware symptoms. 2. Quarantine the infected systems. 3. Disable System Restore (in Windows). 4. Remediate the infected systems. <ol style="list-style-type: none"> a. Update the anti-malware software. b. Scan and use removal techniques (safe mode, pre-installation environment). 5. Schedule scans and run updates. 6. Enable System Restore and create a restore point (in Windows). 7. Educate the end user.
13.7	Authentication	<p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>Administrative</p> <ul style="list-style-type: none"> ○ Computer Management ○ Device Manager ○ Local Users and Groups ○ Local Security Policy ○ Performance Monitor ○ Services ○ System Configuration ○ Task Scheduler ○ Component Services ○ Data Sources ○ Print Management

- Windows Memory Diagnostics
- Windows Firewall
- Advanced Security

1.6 Given a scenario, use Microsoft Windows Control Panel utilities.

Credential Manager

2.2 Explain logical security concepts.

Software tokens
User authentication/strong passwords
Multifactor authentication
Directory permissions
Smart card

2.3 Compare and contrast wireless security protocols and authentication methods.

Authentication

- Single-factor
- Multifactor

2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings.

User authentication

- Single sign-on

2.7 Given a scenario, implement security best practices to secure a workstation.

Password best practices

- Setting strong passwords
- Password expiration
- Screensaver required password
- BIOS/UEFI passwords
- Requiring passwords

Account management

- Failed attempts lockout
- Basic Active Directory functions - Password reset/unlock account

4.8 Identify the basics of scripting.

		Environment variables
13.8	File Encryption	<p>1.2 Compare and contrast features of Microsoft Windows versions.</p> <p>Corporate vs. personal needs</p> <ul style="list-style-type: none"> ○ Bitlocker ○ EFS <p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>Bitlocker</p> <p>2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings.</p> <p>BitLocker BitLocker To Go EFS</p> <p>2.7 Given a scenario, implement security best practices to secure a workstation.</p> <p>Data encryption</p>
13.9	Network Security	<p>2.2 Explain logical security concepts.</p> <p>Port security MAC address filtering</p> <p>2.7 Given a scenario, implement security best practices to secure a workstation.</p> <p>Account management</p> <ul style="list-style-type: none"> ○ Disabling guest account ○ Basic Active Directory functions - Disable account <p>2.10 Given a scenario, configure security on SOHO wireless and wired networks.</p> <p>Wireless-specific</p> <ul style="list-style-type: none"> ○ Changing default SSID ○ Setting encryption ○ Disabling SSID broadcast

		<ul style="list-style-type: none"> ○ Antenna and access point placement ○ Radio power levels ○ WPS <p>Change default usernames and passwords Enable MAC filtering Assign static IP addresses Firewall settings Port forwarding/mapping Disabling ports Content filtering/parental controls Update firmware Physical security</p>
13.10	Firewalls	<p>1.5 Given a scenario, use Microsoft operating system features and tools.</p> <p>Administrative</p> <ul style="list-style-type: none"> ○ Computer Management ○ Device Manager ○ Local Users and Groups ○ Local Security Policy ○ Performance Monitor ○ Services ○ System Configuration ○ Task Scheduler ○ Component Services ○ Data Sources ○ Print Management ○ Windows Memory Diagnostics ○ Windows Firewall ○ Advanced Security <p>1.6 Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>Windows Firewall</p> <p>1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.</p> <p>Firewall settings</p> <ul style="list-style-type: none"> ○ Exceptions ○ Configuration

		<ul style="list-style-type: none"> ○ Enabling/disabling Windows Firewall <p>2.2 Explain logical security concepts.</p> <p>Firewalls Email filtering</p> <p>2.4 Given a scenario, detect, remove, and prevent malware using appropriate tools and methods.</p> <p>Tools and methods</p> <ul style="list-style-type: none"> ○ Software firewalls
13.11	Proxy Servers	<p>1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.</p> <p>Proxy settings</p>
13.12	VPN	<p>1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.</p> <p>Establish networking connections</p> <ul style="list-style-type: none"> ○ VPN <p>2.2 Explain logical security concepts.</p> <p>VPN</p> <p>4.9 Given a scenario, use remote access technologies.</p> <p>Security considerations of each access method</p>
13.13	Security Troubleshooting	<p>1.7 Summarize application installation and configuration concepts.</p> <p>Security considerations</p> <ul style="list-style-type: none"> ○ Impact to device ○ Impact to network <p>2.4 Given a scenario, detect, remove, and prevent malware using appropriate tools and methods.</p> <p>Tools and methods</p>

- Antivirus
- Anti-malware
- Recovery console
- Backup/restore
- End user education
- SecureDNS

3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.

Common symptoms

- Slow performance
- Slow bootup

Common solutions

- Safe boot

3.2 Given a scenario, troubleshoot and resolve PC security issues.

Common symptoms

- Pop-ups
- Browser redirection
- Security alerts
- Slow performance
- Internet connectivity issues
- PC/OS lockup
- Application crash
- OS updates failures
- Rogue antivirus
- Spam
- Renamed system files
- Disappearing files
- File permission changes
- Hijacked email - Responses from users regarding email
- Hijacked email - Automated replies from unknown sent email
- Access denied
- Invalid certificate (trusted root CA)
- System/application log errors

14.0	Capstone Exercises	
A.0	PC Pro Certification Practice Exams	

A.1	Preparing for Certification	
A.2	PC Pro Domain Practice	
B.0	CompTIA A+ 220-1001 Core 1 Practice Exams	
B.1	Preparing for Certification	
B.2	A+ 220-1001 Core 1 Domain Practice (20 Random Questions)	
B.3	A+ 220-1001 Core 1 Domain Practice (All Questions)	
C.0	CompTIA A+ 220-1002 Core 2 Practice Exams	
C.1	Preparing for Certification	
C.2	A+ 220-1002 Core 2 Domain Practice (20 Random Questions)	
C.3	A+ 220-1002 Core 2 Domain Practice (All Questions)	

Objective Mapping: CompTIA 220-2202 Objectives to LabSim Section

The TestOut PC Pro course and certification exam cover the following CompTIA A+ Certification 220-1002 objectives:

#	Domain	Section
1.0	Operating Systems	
1.1	<p>Compare and contrast common operating system types and their purposes.</p> <ul style="list-style-type: none"> 32-bit vs. 64-bit <ul style="list-style-type: none"> ○ RAM limitations ○ Software compatibility Workstation operating systems <ul style="list-style-type: none"> ○ Microsoft Windows ○ Apple Macintosh OS ○ Linux Cell phone/tablet operating systems <ul style="list-style-type: none"> ○ Microsoft Windows ○ Android ○ iOS ○ Chrome OS Vendor-specific limitations <ul style="list-style-type: none"> ○ End-of-life ○ Update limitations Compatibility concerns between operating systems 	<p>1.3, 1.4, 1.5 3.5 9.5 10.2 12.10</p>
1.2	<p>Compare and contrast features of Microsoft Windows versions.</p> <ul style="list-style-type: none"> Windows 7 Windows 8 Windows 8.1 Windows 10 Corporate vs. personal needs <ul style="list-style-type: none"> ○ Domain access ○ Bitlocker ○ Media center ○ Branchcache ○ EFS 	<p>10.2 13.8</p>

	Desktop styles/user interface	
1.3	<p>Summarize general OS installation considerations and upgrade methods.</p> <p>Boot methods</p> <ul style="list-style-type: none"> ○ USB ○ CD-ROM ○ DVD ○ PXE ○ Solid state/flash drives ○ Netboot ○ External/hot-swappable drive ○ Internal hard drive (partition) <p>Type of installations</p> <ul style="list-style-type: none"> ○ Unattended installation ○ In-place upgrade ○ Clean install ○ Repair installation ○ Multiboot ○ Remote network installation ○ Image deployment ○ Recovery partition ○ Refresh/restore <p>Partitioning</p> <ul style="list-style-type: none"> ○ Dynamic ○ Basic ○ Primary ○ Extended ○ Logical ○ GPT <p>File system types/formatting</p> <ul style="list-style-type: none"> ○ ExFAT ○ FAT32 ○ NTFS ○ CDFS ○ NFS ○ ext3, ext4 ○ HFS ○ Swap partition ○ Quick format vs. full format <p>Load alternate third-party drivers when necessary</p> <p>Workgroup vs. Domain setup</p>	<p>1.5</p> <p>5.5, 5.6</p> <p>10.2, 10.3</p> <p>11.4</p> <p>12.10, 12.11, 12.14</p> <p>13.2</p>

	<p>Time/date/region/language settings Driver installation, software, and Windows updates Factory recovery partition Properly formatted boot drive with the correct partitions/format Prerequisites/hardware compatibility Application compatibility OS compatibility/upgrade path</p>	
1.4	<p>Given a scenario, use appropriate Microsoft command line tools.</p> <p>Navigation</p> <ul style="list-style-type: none"> o dir o cd.. <p>ipconfig ping tracert netstat nslookup shutdown dism sfc chkdsk diskpart taskkill gpupdate gpresult format copy xcopy robocopy net use net user [command name] /? Commands available with standard privileges vs. administrative privileges</p>	<p>5.6, 5.9 6.9 10.3 11.2, 11.4 12.1, 12.5, 12.15</p>
1.5	<p>Given a scenario, use Microsoft operating system features and tools.</p> <p>Administrative</p> <ul style="list-style-type: none"> o Computer Management o Device Manager o Local Users and Groups 	<p>3.9 4.5, 4.6 5.6, 5.7, 5.8, 5.9 8.4 11.4</p>

	<ul style="list-style-type: none"> ○ Local Security Policy ○ Performance Monitor ○ Services ○ System Configuration ○ Task Scheduler ○ Component Services ○ Data Sources ○ Print Management ○ Windows Memory Diagnostics ○ Windows Firewall ○ Advanced Security ○ Event Viewer ○ User Account Management <p>MSConfig</p> <ul style="list-style-type: none"> ○ General ○ Boot ○ Services ○ Startup ○ Tools <p>Task Manager</p> <ul style="list-style-type: none"> ○ Applications ○ Processes ○ Performance ○ Networking ○ Users <p>Disk Management</p> <ul style="list-style-type: none"> ○ Drive status ○ Mounting ○ Initializing ○ Extending partitions ○ Splitting partitions ○ Shrink partitions ○ Assigning/changing drive letters ○ Adding drives ○ Adding arrays ○ Storage spaces <p>System utilities</p> <ul style="list-style-type: none"> ○ Regedit ○ Command ○ Services.msc ○ MMC ○ MSTSC ○ Notepad 	<p>12.1, 12.3, 12.5, 12.7, 12.10, 12.12 13.7, 13.10</p>
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	<ul style="list-style-type: none"> ○ Explorer ○ Msinfo32 ○ DxDiag ○ Disk Defragmenter ○ System Restore ○ Windows Update 	
1.6	<p>Given a scenario, use Microsoft Windows Control Panel utilities.</p> <p>Internet Options</p> <ul style="list-style-type: none"> ○ Connections ○ Security ○ General ○ Privacy ○ Programs ○ Advanced <p>Display/Display Settings</p> <ul style="list-style-type: none"> ○ Resolution ○ Color depth ○ Refresh rate <p>User Accounts</p> <p>Folder Options</p> <ul style="list-style-type: none"> ○ View hidden files ○ Hide extensions ○ General options ○ View options <p>System</p> <ul style="list-style-type: none"> ○ Performance (virtual memory) ○ Remote settings ○ System protection <p>Windows Firewall</p> <p>Power Options</p> <ul style="list-style-type: none"> ○ Hibernate ○ Power plans ○ Sleep/suspend ○ Standby <p>Credential Manager</p> <p>Programs and features</p> <p>HomeGroup</p> <p>Devices and Printers</p> <p>Sound</p> <p>Troubleshooting</p>	<p>3.13</p> <p>4.3, 4.5</p> <p>6.6</p> <p>8.2</p> <p>9.3</p> <p>10.2</p> <p>11.2</p> <p>12.1, 12.5, 12.6, 12.7, 12.12, 12.13</p> <p>13.7, 13.8, 13.10</p>

	<p>Network and Sharing Center Device Manager Network and Sharing Center Device Manager Bitlocker Sync Center</p>	
1.7	<p>Summarize application installation and configuration concepts.</p> <ul style="list-style-type: none"> System requirements <ul style="list-style-type: none"> ○ Drive space ○ RAM OS requirements <ul style="list-style-type: none"> ○ Compatibility Methods of installation and deployment <ul style="list-style-type: none"> ○ Local (CD/USB) ○ Network-based Local user permissions <ul style="list-style-type: none"> ○ Folder/file access for installation Security considerations <ul style="list-style-type: none"> ○ Impact to device ○ Impact to network 	<p>3.7 5.6 10.2, 10.3 11.3 12.10 13.13</p>
1.8	<p>Given a scenario, configure Microsoft Windows networking on a client/desktop.</p> <ul style="list-style-type: none"> HomeGroup vs. Workgroup Domain setup Network shares/administrative shares/mapping drives Printer sharing vs. network printer mapping Establish networking connections <ul style="list-style-type: none"> ○ VPN ○ Dial-ups ○ Wireless ○ Wired ○ WWAN (Cellular) Proxy settings Remote Desktop Connection Remote Assistance Home vs. Work vs. Public network settings Firewall settings <ul style="list-style-type: none"> ○ Exceptions 	<p>6.2, 6.4, 6.6, 6.8 7.1 8.3 10.2 11.4 12.6 13.10, 13.11, 13.12</p>

	<ul style="list-style-type: none"> ○ Configuration ○ Enabling/disabling Windows Firewall <p>Configuring an alternative IP address in Windows</p> <ul style="list-style-type: none"> ○ IP addressing ○ Subnet mask ○ DNS ○ Gateway <p>Network card properties</p> <ul style="list-style-type: none"> ○ Half duplex/full duplex/auto ○ Speed ○ Wake-on-LAN ○ QoS ○ BIOS (on-board NIC) 	
1.9	<p>Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.</p> <p>Best practices</p> <ul style="list-style-type: none"> ○ Scheduled backups ○ Scheduled disk maintenance ○ System updates/App Store ○ Patch management ○ Driver/firmware updates ○ Antivirus/Anti-malware updates <p>Tools</p> <ul style="list-style-type: none"> ○ Backup/Time Machine ○ Restore/Snapshot ○ Image recovery ○ Disk maintenance utilities ○ Shell/Terminal ○ Screen sharing ○ Force Quit <p>Features</p> <ul style="list-style-type: none"> ○ Multiple desktops/Mission Control ○ Key Chain ○ Spot Light ○ iCloud ○ Gestures ○ Finder ○ Remote Disc ○ Dock ○ Boot Camp <p>Basic Linux commands</p>	<p>1.4, 1.5 4.5 6.9 11.5 12.1, 12.6, 12.8, 12.10, 12.11, 12.12 13.6</p>

	<ul style="list-style-type: none"> ○ ls ○ grep ○ cd ○ shutdown ○ pwd vs. passwd ○ mv ○ cp ○ rm ○ chmod ○ chown ○ iwconfig/ifconfig ○ ps ○ su/sudo ○ apt-get ○ vi ○ dd ○ kill 	
2.0	Security	
2.1	<p>Summarize the importance of physical security measures.</p> <p>Mantrap Badge reader Smart card Security guard Door lock Biometric locks Hardware tokens Cable locks Server locks USB locks Privacy screen Key fobs Entry control roster</p>	13.3
2.2	<p>Explain logical security concepts.</p> <p>Active Directory</p> <ul style="list-style-type: none"> ○ Login script ○ Domain 	7.1 9.7 12.4, 12.5 13.1, 13.3, 13.6, 13.7, 13.9, 13.10, 13.12

	<ul style="list-style-type: none"> ○ Group Policy/Updates ○ Organizational Units ○ Home Folder ○ Folder redirection <p>Software tokens MDM policies Port security MAC address filtering Certificates Antivirus/Anti-malware Firewalls User authentication/strong passwords Multifactor authentication Directory permissions VPN DLP Access control lists Smart card Email filtering Trusted/untrusted software sources Principle of least privilege</p>	
2.3	<p>Compare and contrast wireless security protocols and authentication methods.</p> <p>Protocols and encryption</p> <ul style="list-style-type: none"> ○ WEP ○ WPA ○ WPA2 ○ TKIP ○ AES <p>Authentication</p> <ul style="list-style-type: none"> ○ Single-factor ○ Multifactor ○ RADIUS ○ TACACS 	7.1 13.7
2.4	<p>Given a scenario, detect, remove, and prevent malware using appropriate tools and methods.</p> <p>Malware</p> <ul style="list-style-type: none"> ○ Ransomware ○ Trojan 	13.6, 13.10, 13.13

	<ul style="list-style-type: none"> ○ Keylogger ○ Rootkit ○ Virus ○ Botnet ○ Worm ○ Spyware <p>Tools and methods</p> <ul style="list-style-type: none"> ○ Antivirus ○ Anti-malware ○ Recovery console ○ Backup/restore ○ End user education ○ Software firewalls ○ SecureDNS 	
2.5	<p>Compare and contrast social engineering, threats, and vulnerabilities.</p> <p>Social engineering</p> <ul style="list-style-type: none"> ○ Phishing ○ Spear phishing ○ Impersonation ○ Shoulder surfing ○ Tailgating ○ Dumpster diving <p>DDoS</p> <p>DoS</p> <p>Zero-day</p> <p>Man-in-the-middle</p> <p>Brute force</p> <p>Dictionary</p> <p>Rainbow table</p> <p>Spoofing</p> <p>Non-compliant systems</p> <p>Zombie</p>	<p>6.9</p> <p>13.6</p>
2.6	<p>Compare and contrast the differences of basic Microsoft Windows OS security settings.</p> <p>User and groups</p> <ul style="list-style-type: none"> ○ Administrator ○ Power user ○ Guest 	<p>11.1, 11.2, 11.3, 11.4</p> <p>12.1, 12.5</p> <p>13.7, 13.8</p>

	<ul style="list-style-type: none"> ○ Standard user <p>NTFS vs. share permissions</p> <ul style="list-style-type: none"> ○ Allow vs. deny ○ Moving vs. copying folders and files ○ File attributes <p>Shared files and folders</p> <ul style="list-style-type: none"> ○ Administrative shares vs. local shares ○ Permission propagation ○ Inheritance <p>System files and folders</p> <p>User authentication</p> <ul style="list-style-type: none"> ○ Single sign-on <p>Run as administrator vs. standard user</p> <p>BitLocker</p> <p>BitLocker To Go</p> <p>EFS</p>	
2.7	<p>Given a scenario, implement security best practices to secure a workstation.</p> <p>Password best practices</p> <ul style="list-style-type: none"> ○ Setting strong passwords ○ Password expiration ○ Screensaver required password ○ BIOS/UEFI passwords ○ Requiring passwords <p>Account management</p> <ul style="list-style-type: none"> ○ Restricting user permissions ○ Logon time restrictions ○ Disabling guest account ○ Failed attempts lockout ○ Timeout/screen lock ○ Change default admin user account/password ○ Basic Active Directory functions - Account creation ○ Basic Active Directory functions - Account deletion ○ Basic Active Directory functions - Password reset/unlock account ○ Basic Active Directory functions - Disable account <p>Disable autorun</p> <p>Data encryption</p> <p>Patch/update management</p>	12.1, 12.4, 12.5, 12.10 13.1, 13.3, 13.5, 13.7, 13.8, 13.9
2.8	<p>Given a scenario, implement methods for securing mobile devices.</p>	9.7

	<p>Screen locks</p> <ul style="list-style-type: none"> ○ Fingerprint lock ○ Face lock ○ Swipe lock ○ Passcode lock <p>Remote wipes</p> <p>Locator applications</p> <p>Remote backup applications</p> <p>Failed login attempts restrictions</p> <p>Antivirus/Anti-malware</p> <p>Patching/OS updates</p> <p>Biometric authentication</p> <p>Full device encryption</p> <p>Multifactor authentication</p> <p>Authenticator applications</p> <p>Trusted sources vs. untrusted sources</p> <p>Firewalls</p> <p>Policies and procedures</p> <ul style="list-style-type: none"> ○ BYOD vs. corporate-owned ○ Profile security requirements 	
2.9	<p>Given a scenario, implement appropriate data destruction and disposal methods.</p> <p>Physical destruction</p> <ul style="list-style-type: none"> ○ Shredder ○ Drill/hammer ○ Electromagnetic (Degaussing) ○ Incineration ○ Certificate of destruction <p>Recycling or repurposing best practices</p> <ul style="list-style-type: none"> ○ Low-level format vs. standard format ○ Overwrite ○ Drive wipe 	13.3
2.10	<p>Given a scenario, configure security on SOHO wireless and wired networks.</p> <p>Wireless-specific</p> <ul style="list-style-type: none"> ○ Changing default SSID ○ Setting encryption ○ Disabling SSID broadcast 	13.9

	<ul style="list-style-type: none"> ○ Antenna and access point placement ○ Radio power levels ○ WPS <p>Change default usernames and passwords Enable MAC filtering Assign static IP addresses Firewall settings Port forwarding/mapping Disabling ports Content filtering/parental controls Update firmware Physical security</p>	
3.0	Software Troubleshooting	
3.1	<p>Given a scenario, troubleshoot Microsoft Windows OS problems.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Slow performance ○ Limited connectivity ○ Failure to boot ○ No OS found ○ Application crashes ○ Blue screens ○ Black screens ○ Printing issues ○ Services fail to start ○ Slow bootup ○ Slow profile load <p>Common solutions</p> <ul style="list-style-type: none"> ○ Defragment the hard drive ○ Reboot ○ Kill tasks ○ Restart services ○ Update network settings ○ Reimage/reload OS ○ Roll back updates ○ Roll back devices drivers ○ Apply updates ○ Repair application ○ Update boot order ○ Disable Windows services/applications 	<p>4.6 6.9, 6.10 7.5 8.6 10.2 12.1, 12.11, 12.12, 12.14, 12.15 13.6, 13.13</p>

	<ul style="list-style-type: none"> ○ Disable application startup ○ Safe boot ○ Rebuild Windows profiles 	
3.2	<p>Given a scenario, troubleshoot and resolve PC security issues.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Pop-ups ○ Browser redirection ○ Security alerts ○ Slow performance ○ Internet connectivity issues ○ PC/OS lockup ○ Application crash ○ OS updates failures ○ Rogue antivirus ○ Spam ○ Renamed system files ○ Disappearing files ○ File permission changes ○ Hijacked email - Responses from users regarding email ○ Hijacked email - Automated replies from unknown sent email ○ Access denied ○ Invalid certificate (trusted root CA) ○ System/application log errors 	<p>12.14</p> <p>13.13</p>
3.3	<p>Given a scenario, use best practice procedures for malware removal.</p> <ol style="list-style-type: none"> 1. Identify and research malware symptoms. 2. Quarantine the infected systems. 3. Disable System Restore (in Windows). 4. Remediate the infected systems. <ol style="list-style-type: none"> a. Update the anti-malware software. b. Scan and use removal techniques (safe mode, pre-installation environment). 5. Schedule scans and run updates. 6. Enable System Restore and create a restore point (in Windows). 7. Educate the end user. 	<p>13.6</p>
3.4	<p>Given a scenario, troubleshoot mobile OS and application issues.</p>	<p>9.8</p>

	<p>Common symptoms</p> <ul style="list-style-type: none"> ○ Dim display ○ Intermittent wireless ○ No wireless connectivity ○ No Bluetooth connectivity ○ Cannot broadcast to external monitor ○ Touchscreen non-responsive ○ Apps not loading ○ Slow performance ○ Unable to decrypt email ○ Extremely short battery life ○ Overheating ○ Frozen system ○ No sound from speakers ○ Inaccurate touch screen response ○ System lockout ○ App log errors 	
3.5	<p>Given a scenario, troubleshoot mobile OS and application security issues.</p> <p>Common symptoms</p> <ul style="list-style-type: none"> ○ Signal drop/weak signal ○ Power drain ○ Slow data speeds ○ Unintended WiFi connection ○ Unintended Bluetooth pairing ○ Leaked personal files/data ○ Data transmission over limit ○ Unauthorized account access ○ Unauthorized location tracking ○ Unauthorized camera/microphone activation ○ High resource utilization 	9.7, 9.8
4.0	Operational Procedures	
4.1	<p>Compare and contrast best practices associated with types of documentation.</p> <p>Network topology diagrams Knowledge base/articles Incident documentation</p>	2.6 4.1 13.1, 13.2, 13.3

	<p>Regulatory and compliance policy Acceptable use policy Password policy Inventory management</p> <ul style="list-style-type: none"> ○ Asset tags ○ Barcodes 	
4.2	<p>Given a scenario, implement basic change management best practices.</p> <p>Documented business processes Purpose of the change Scope the change Risk analysis Plan for change End-user acceptance Change board</p> <ul style="list-style-type: none"> ○ Approvals <p>Backout plan Document changes</p>	2.3
4.3	<p>Given a scenario, implement basic disaster prevention and recovery methods.</p> <p>Backup and recovery</p> <ul style="list-style-type: none"> ○ Image level ○ File level ○ Critical applications <p>Backup testing UPS Surge protector Cloud storage vs. local storage backups Account recovery options</p>	2.5 9.7 10.2 12.11
4.4	<p>Explain common safety procedures.</p> <p>Equipment grounding Proper component handling and storage</p> <ul style="list-style-type: none"> ○ Antistatic bags ○ ESD straps ○ ESD mats ○ Self-grounding 	2.1

	<p>Toxic waste handling</p> <ul style="list-style-type: none"> ○ Batteries ○ Toner ○ CRT ○ Cell phones ○ Tablets <p>Personal safety</p> <ul style="list-style-type: none"> ○ Disconnect power before repairing PC ○ Remove jewelry ○ Lifting techniques ○ Weight limitations ○ Electrical fire safety ○ Cable management ○ Safety goggles ○ Air filter mask <p>Compliance with government regulations</p>	
4.5	<p>Explain environmental impacts and appropriate controls.</p> <p>MSDS documentation for handling and disposal Temperature, humidity level awareness, and proper ventilation Power surges, brownouts, and blackouts</p> <ul style="list-style-type: none"> ○ Battery backup ○ Surge suppressor <p>Protection from airborne particles</p> <ul style="list-style-type: none"> ○ Enclosures ○ Air filters/mask <p>Dust and debris</p> <ul style="list-style-type: none"> ○ Compressed air ○ Vacuums <p>Compliance to government regulations</p>	2.1, 2.5
4.6	<p>Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.</p> <p>Incident response</p> <ul style="list-style-type: none"> ○ First response - Identify ○ First response - Report through proper channels ○ First response - Data/device preservation ○ Use of documentation/documentation changes ○ Chain of custody - Tracking of evidence/documenting process <p>Licensing/DRM/EULA</p>	12.9 13.1, 13.2, 13.4

	<ul style="list-style-type: none"> ○ Open-source vs. commercial license ○ Personal license vs. enterprise licenses <p>Regulated data</p> <ul style="list-style-type: none"> ○ PII ○ PCI ○ GDPR ○ PHI <p>Follow all policies and security best practices</p>	
4.7	<p>Given a scenario, use proper communication techniques and professionalism.</p> <p>Use proper language and avoid jargon, acronyms, and slang, when applicable Maintain a positive attitude/project confidence Actively listen (taking notes) and avoid interrupting the customer Be culturally sensitive</p> <ul style="list-style-type: none"> ○ Use appropriate professional titles, when applicable <p>Be on time (if late, contact the customer) Avoid distractions</p> <ul style="list-style-type: none"> ○ Personal calls ○ Texting/social media sites ○ Talking to coworkers while interacting with customers ○ Personal interruptions <p>Dealing with difficult customers or situations</p> <ul style="list-style-type: none"> ○ Do not argue with customers and/or be defensive ○ Avoid dismissing customer problems ○ Avoid being judgmental ○ Clarify customer statements (ask open-ended questions to narrow the scope of the problem, restate the issue, or question to verify understanding) ○ Do not disclose experiences via social media outlets <p>Set and meet expectations/timeline and communicate status with the customer</p> <ul style="list-style-type: none"> ○ Offer different repair/replacement options, if applicable ○ Provide proper documentation on the services provided ○ Follow up with customer/user at a later date to verify satisfaction <p>Deal appropriately with customers' confidential and private materials</p> <ul style="list-style-type: none"> ○ Located on a computer, desktop, printer, etc. 	2.2
4.8	<p>Identify the basics of scripting.</p> <p>Script file types</p> <ul style="list-style-type: none"> ○ .bat ○ .ps1 	1.4 11.1, 11.2 12.1, 12.14 13.7

	<ul style="list-style-type: none"> ○ .vbs ○ .sh ○ .py ○ .js <p>Environment variables</p> <p>Comment syntax</p> <p>Basic script constructs</p> <ul style="list-style-type: none"> ○ Basic loops ○ Variables <p>Basic data types</p> <ul style="list-style-type: none"> ○ Integers ○ Strings 	
4.9	<p>Given a scenario, use remote access technologies.</p> <p>RDP</p> <p>Telnet</p> <p>SSH</p> <p>Third-party tools</p> <ul style="list-style-type: none"> ○ Screen share feature ○ File share <p>Security considerations of each access method</p>	<p>6.5</p> <p>11.4</p> <p>12.6</p> <p>13.12</p>