TestOut®

TestOut PC Pro - English 6.0.x

LESSON PLAN

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1.1: Course Introduction

Summary

This course is designed to prepare you to pass the TestOut PC Pro and CompTIA A+ certifications. The TestOut PC Pro certification is the first exam of the TestOut Pro certifications. This certification measures not just what you know, but what you can do. It measures your ability to install, manage, repair, and troubleshoot PC hardware and Windows, Linux, and Mac operating systems.
Before you take this course, you should have a basic understanding of computers. You should be familiar with how to:

- Use a mouse and keyboard
- Install and run programs
- Use basic productivity software, including word processing applications
- Save files created by common applications
- Browse the internet

The PC Pro certification addresses the following knowledge domains:

- Hardware
- Software
- Security
- Troubleshooting

In addition to covering everything you need to know to become certified, this course is designed to help you gain real-world skills that you will use every day as a PC technician. By the time you are done with this course, you should be able to do the following:

- Set up a new computer.
- Identify system requirements when purchasing a new computer.
- Understand the technology and specifications used to describe computer components.
- Make informed choices about which device characteristics are required for your situation.
- Install or upgrade the operating system.
- Manage external devices.
- Troubleshoot common computer problems that can be resolved without replacing internal components.
- Connect to a small home network.

Video/Demo	Time
1.1.1 PC Pro Introduction	6:29

1.1.2 Use the Simulator	14:55
1.1.4 Work with Internal Components	9:28
Total Video Time	**30:52**

Lab/Activity

- 1.1.3 Explore the Lab Interface
- 1.1.5 Connect Internal Components

Total Time

About 55 minutes

1.2: Hardware Basics

Lecture Focus Questions:

- What is the difference between hardware, software, and firmware?
- Which types of devices use USB ports?
- What are common input and output devices?
- What is the definition of processing?
- What are the most common types of storage devices?
- Why is it important to increase componentization and standardization?

In this section, you will learn to:

- Identify common I/O ports by sight
- Connect common peripherals to standard ports

Key terms for this section include the following:

Term	Definition
Hardware	The physical components that compose a computer system or network.
Software	Instructions or data that are stored electronically, either on a hard drive or a special chip.
Input	The movement of data or commands to the internal computer hardware.
Processing	The flow of data through a series of procedures as defined by a set of instructions.
Storage devices	Devices that contain non-volatile memory for saving or maintaining data.
Output	The process of the computer presenting, displaying, or otherwise giving data.
Networking and communications	The practice of connecting two or more computers in order to transfer data.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1001	1.1 Given a scenario, install components within the display of a laptop. • Microphone 3.1 Explain basic cable types, features, and their purposes. • Multipurpose cables

- Thunderbolt

- Peripheral cables
  - Serial
- Hard drive cables
  - SATA
  - IDE
- Adapters
  - DVI to HDMI
  - USB to Ethernet
  - DVI to VGA

3.2 Identify common connector types.

- RJ-11
- RJ-45
- RS-232
- DB-9
- SCSI

3.6 Explain the purposes and uses of various peripheral types.

- ADF/flatbed scanner
- Barcode scanner/QR scanner
- Mouse
- Keyboard
- Touchpad
- Game controllers
- Camera/webcam
- Microphone

Video/Demo	Time
1.2.1 Computing Basics	10:49
1.2.3 External Components	5:50
1.2.6 Internal Components	3:09
Total Video Time	**19:48**

Lab/Activity

- 1.2.7 Set Up a Computer

Fact Sheets

- 1.2.2 Computing Facts
- 1.2.4 Port and Connector Facts
- 1.2.5 Adapter and Converter Facts

Number of Exam Questions

15 questions

Total Time

About 62 minutes

1.3: Windows Basics

Lecture Focus Questions:

- What are the kernel's functions?
- What is the difference between a GUI and a CLI?
- What type of information is shown on the taskbar?
- Which Windows interface components would you use to switch from one running program to another?
- How does an index improve searching on your computer?

In this lesson, you will learn to:

- Navigate the Windows 10 interface

Key terms for this section include the following:

Term	Definition
Operating system	A set of programs that acts as an interface between the applications that are running on a computer and the computer's hardware.
Multiprocessing	The ability to use multiple processing devices.
Multitasking	The ability to run multiple applications simultaneously.
Multithreading	The ability to run multiple parts of an application simultaneously.
Kernel	The core of the operating system that is loaded into memory when the system boots up.
Driver	A type of computer program that enables the operating system to interact with hardware devices.
Interface	What allows the user to interact with the kernel and the utilities.
Utilities	The features or programs included with an operating system that perform system-related tasks.
Application	A subclass computer program that is designed for end users.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1002	1.1 Compare and contrast common operating system types and their purposes. • Workstation operating systems ○ Microsoft Windows

Video/Demo	Time
1.3.1 Windows Operating Systems	5:17
1.3.3 Use the Windows 10 Interface	7:16

Total Video Time **12:33**

Fact Sheets

- 1.3.2 Windows Operating System Facts
- 1.3.4 Windows Interface Facts

Number of Exam Questions

8 questions

Total Time

About 31 minutes

1.4: Linux Basics

Lecture Focus Questions:

- Why do many administrators choose to use a command line interface on a Linux server?
- What is a Linux distribution?
- Which common commands are used to navigate through shells?
- What types of items can Tab be used to complete once you start typing the entities' name?
- What is the difference between free software and open-source software?

In this section, you will learn to:

- Use shell commands
- Shut down a Linux system

Key terms for this section include the following:

Term	Definition
Linux	An open source operating system.
Distribution	A custom version of Linux.
Shell	A command line interface.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.2 Use operating system features and utilities 2.2.3 Use common Linux command line utilities 1.1 Compare and contrast common operating system types and their purposes. • Workstation operating systems ○ Linux

CompTIA 220-1002	1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.
	• Tools
	  ○ Shell/Terminal
	• Basic Linux commands
	  ○ iwconfig/ifconfig
	  ○ su/sudo

- ls
- pwd vs. passwd
- cd
- mv
- rm
- cp
- dd
- shutdown

4.8 Identify the basics of scripting.

- Environment variables

Video/Demo	Time
1.4.1 Linux Operating Systems	7:32
1.4.2 Use Linux Shell Commands	14:55
Total Video Time	**22:27**

Lab/Activity

- 1.4.4 Use Shell Commands
- 1.4.5 Shut Down a Linux System

Fact Sheets

- 1.4.3 Linux Facts

Number of Exam Questions

8 questions

Total Time

About 60 minutes

1.5: macOS Basics

Lecture Focus Questions:

- What are some characteristics unique to Apple or Mac OS systems?
- Which keyboard key is used for most keyboard shortcuts in Mac OS?
- Which Mac OS feature is used to install Windows on an Apple system?
- What file system does Mac OS use?
- What is the Finder's primary purpose?
- What are the different components of the Mac OS user interface?
- How do you access the multiple desktop feature?

In this section, you will learn to:

- Navigate the Mac OS interface

Key terms for this section include the following:

Term	Definition
Mac OS	A proprietary closed-source, operating system.
HFS	Hierarchical File System.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.2 Use operating system features and utilities 2.2.2 Use core macOS or iOS features

CompTIA 220-1002	1.1 Compare and contrast common operating system types and their purposes.
	• Workstation operating systems
	  ○ Linux
	1.3 Summarize general OS installation considerations and upgrade methods.
	• File system types/formatting
	  ○ HFS
	1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.
	• Features
	  ○ Multiple desktops/Mission Control
	  ○ Key Chain

- Spot Light
- iCloud
- Gestures
- Finder
- Remote Disc
- Dock
- Boot Camp

Video/Demo	Time
1.5.1 macOS Introduction	4:51
1.5.2 Use the macOS Interface	8:53
1.5.3 macOS Features and Settings	7:05
Total Video Time	**20:49**

Fact Sheets

1.5.4 macOS Facts

Number of Exam Questions

8 questions

Total Time

About 34 minutes

2.1: Protection and Safety

Lecture Focus Questions:

- Which specific computer components require special care that will protect your safety when handling them?
- What is the proper way to lift heavy objects?
- How can ESD be a hazard to electronic computer components?
- What is the difference between a static shielding bag and a static-resistant bag?
- What steps can you take to reduce ESD if you do not have the proper equipment handy?
- What is the MSDS? When would the information that it provides be important?

In this section, you will learn to:

- Use an anti-static mat and strap to protect yourself from ESD
- Implement appropriate grounding procedures

Key terms for this section include the following:

Term	Definition
Capacitor	A device that stores an electric charge.
Cathode Ray Tube (CRT)	A vacuum tube used to display images that is commonly used in computer monitors.
Electrostatic Discharge (ESD)	The flow of electricity from one electrically charged object to another.
Material Safety Data Sheet (MSDS)	A document that contains safe handling and disposal processes for dangerous materials.
Peripheral device	A device that connects to a computer, such as a monitor or printer.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	4.4 Explain common safety procedures.
	• Equipment grounding
	• Proper component handling and storage
	  ○ Antistatic bags
	  ○ ESD straps
	  ○ ESD mats
	  ○ Self-grounding
	• Toxic waste handling
	  ○ Batteries
	  ○ Toner
	  ○ CRT
	  ○ Cell phones

    - Tablets
- Personal safety
    - Disconnect power before repairing PC
    - Remove jewelry
    - Lifting techniques
    - Weight limitations
    - Electrical fire safety
    - Cable management
    - Safety goggles
    - Air filter mask
- Compliance with government regulation

4.5 Explain environmental impacts and appropriate controls.

- MSDS documentation for handling and disposal
- Temperature, humidity level awareness, and proper ventilation
- Protection from airborne particles
    - Enclosures
    - Air filters/mask
- Dust and debris
- Compliance to government regulations

Video/Demo	Time
2.1.1 Safety	4:53
2.1.3 Electrostatic Discharge	5:14
2.1.4 ESD Protection	4:08
2.1.6 Environmental Concerns	5:28
Total Video Time	**19:43**

Fact Sheets

- 2.1.2 Safety Measures
- 2.1.5 ESD Facts
- 2.1.7 Environmental Facts

Number of Exam Questions

15 questions

Total Time

About 50 minutes

2.2: Professionalism

Lecture Focus Questions:

- What specific things can you do to improve your people skills?
- How does professionalism affect customer satisfaction?
- How does respect affect your actions towards customers?
- Why should you avoid jargon and acronyms when dealing with customers?
- What should you do if you get a phone call while at a customer site?

In this section, you will learn to:

- Use proper communication techniques and exhibit professionalism while interacting with clients

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	4.7 Given a scenario, use proper communication techniques and professionalism.
	• 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
	  ○ Use appropriate professional titles, when applicable
	• Be on time (if late, contact the customer)
	• Avoid distractions
	  ○ Personal calls
	  ○ Texting/social media sites
	  ○ Talking to coworkers while interacting with customers
	  ○ Personal interruptions
	• Dealing with difficult customers or situations
	  ○ 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
- Set and meet expectations/timeline and communicate status with the customer
    - 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
- Deal appropriately with customers' confidential and private materials
    - Located on a computer, desktop, printer, etc.

Video/Demo	Time
2.2.1 Professionalism	5:42
Total Video Time	**5:42**

Fact Sheets

2.2.2 Professionalism Facts

Number of Exam Questions

15 questions

Total Time

About 26 minutes

2.3: Change Management

Lecture Focus Questions:

- What are the main steps in the change management process?
- What information is generally required on a change order form?
- What information should you provide as part of the risk analysis?
- What is a change board's purpose?
- Why is it critical to obtain written approval of changes?
- What are the benefits of taking the time to go through a change management process?

In this section, you will learn to:

- Go through the change management process to request changes to a project

Key terms for this section include the following:

Term	Definition
Backout plan	A plan for returning affected systems and hardware to their original state if a new implementation fails.
Change board	A predetermined group of people that must approve proposed changes to a project that is underway.
Change management	The process of regulating changes to a project once it is underway.
Change order form	A form that must be completed and submitted to a change board to request permission to change a project's purpose, scope, schedule, budget, team, or other significant component.
Scope	The extent of a project, area, or subject; what is included and what is not.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1002	4.2 Given a scenario, implement basic change management best practices. • Documented business processes • Purpose of the change • Scope the change • Risk analysis • Plan for change • End-user acceptance • Change board ○ Approvals • Backout plan

- Document changes

Video/Demo	Time
2.3.1 Change Management Overview	4:28
Total Video Time	**4:28**

Fact Sheets

2.3.2 Change Management Facts

Number of Exam Questions

5 questions

Total Time

About 15 minutes

2.4: PC Tools

Lecture Focus Questions:

- When working with computer hardware, what is the advantage of having a ratcheting handle on a screwdriver?
- What is a good tool to use to retrieve a screw that has fallen into a computer case?
- What types of electrical properties can a multimeter measure?
- How is a power supply tester used to test the output from a PC power supply?
- How does a loopback plug verify that a device can both send and receive signals?
- How can ESD damage computer components?
- What measures should you take to protect hardware against ESD damage?
- When a wrist strap is unavailable, how can you still protect the computer from ESD while working in it?

In this section, you will learn to:

- Use a PC toolkit

Key terms for this section include the following:

Term	Definition
Antistatic pad	An insulated covering that prevents static electricity from moving between objects and damaging computer components.
Antistatic wrist strap	A strap that connects you to an antistatic pad to prevent static electricity from damaging computer components.
Cable tester	A tool that verifies that network signals can travel throughout a network.
Combination ratchet/screwdriver	A multi-tool with interchangeable bits.
Extension magnet	A small magnet on a collapsible rod used to retrieve parts that fall into a computer case or another area that hands cannot reach.
IC insertion and extraction tool	A plastic and metal tool used to add and remove integrated circuit chips.
Loopback plug	A small tool used to test network communications.
Multimeter	A handheld device with a digital readout used to test electrical properties.
Power supply tester	A special multimeter used to test output from a PC power supply.

POST card	An expansion board used to troubleshoot computer system startup.
Three-pronged parts retriever	A small tool used to grasp and retrieve small parts that fall into places difficult to reach with hands.

Video/Demo	Time
2.4.1 PC Toolkit	5:21
Total Video Time	**5:21**

Fact Sheets

2.4.2 Tool Facts

Number of Exam Questions

14 questions

Total Time

About 25 minutes

2.5: PC Maintenance

Lecture Focus Questions:

- Why is dust an enemy to a computer?
- What will too much or too little humidity do to a computer?
- When considering HVAC, what is the difference between a positive pressure system and a negative pressure system?
- What causes EMI? What can you do to prevent EMI problems?
- What types of materials can you use to clean internal PC components?
- When is it important to use an anti-static vacuum?
- How are backups related to preventive maintenance?
- What is the difference between a surge and a spike?
- Which type of device protects equipment from over-voltages?
- What is the difference between the way an online UPS provides power to a system and the way an offline UPS provides power?

In this section, you will learn to:

- Install a UPS
- Configure UPS settings

Key terms for this section include the following:

Term	Definition
Blackout	Complete power failure.
Brownout	An under-voltage that lasts seconds.
Electromagnetic interference (EMI)	A signal caused by motors, heavy machinery, and fluorescent lights that interferes with wired networking signals.
Heating, ventilation, and air conditioning (HVAC)	The system installed within buildings to control temperature by supplying heat and air conditioning.
Line conditioner	A device that modifies power signals to remove noise and create a smooth AC electrical signal.
Radio frequency interference (RFI)	Signals caused by cordless phones, microwave ovens, and wireless devices that interfere with wireless networking.
Sag	An under-voltage that lasts milliseconds.
Spike	An over-voltage that lasts milliseconds.
Standby power supply (SPS)	An offline devices that provides power when an under-voltage occurs.
Surge	An over-voltage that lasts seconds.
Surge suppressor	A device that protects systems from damage from a power surge by suppressing the over-voltage.

Surge protector	A device that protects systems from over-voltages by switching the system off.
Uninterruptible power supply (UPS)	A device that provides battery power to a computer in case of an under-voltage or power failure.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.5 Implement disaster prevention and recovery methods 2.5.3 Install surge protection and a UPS 4.3 Given a scenario, implement basic disaster prevention and recovery methods. • UPS • Surge protector

CompTIA 220-1002	4.5 Explain environmental impacts and appropriate controls.
	• Power surges, brownouts, and blackouts
	  ○ Battery backup
	  ○ Surge suppressor

Video/Demo	Time
2.5.1 PC Maintenance Best Practices	3:22
2.5.3 Protect Power	9:20
2.5.4 Configure UPS Settings	10:25
Total Video Time	**23:07**

Lab/Activity

- 2.5.6 Install a UPS

Fact Sheets

- 2.5.2 PC Maintenance Facts
- 2.5.5 Power Protection Facts

Number of Exam Questions

12 questions

Total Time

About 58 minutes

2.6: Troubleshooting Process Overview

Lecture Focus Questions:

- Why is checking the obvious first so important?
- What place does intuition have in the troubleshooting process?
- What is escalation? When is it the appropriate course of action?
- You have identified the most likely cause of a problem and a course of action to correct the problem. When shouldn't you fix the problem immediately?
- How can user education be a beneficial step in the troubleshooting process?
- How does good documentation help in the troubleshooting process?

In this section, you will learn to:

- Use a troubleshooting process

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	5.1 Given a scenario, use the best practice methodology to resolve problems.
	
	• Always consider corporate policies, procedures, and impacts before implementing changes
	
	1. Identify the problem
	  ○ 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)
	  ○ If necessary, conduct external or internal research based on symptoms
	3. Test the theory to determine cause
	  ○ Once the theory is confirmed, determine the next steps to resolve problem
	  ○ If theory is not confirmed reestablish new theory or escalate
	4. Establish a plan of action to resolve the problem and implement the solution

CompTIA 220-1002	5. Verify full system functionality and, if applicable, implement preventive measures 6. Document findings, actions, and outcomes 4.1 Compare and contrast best practices associated with types of documentation. • Network topology diagrams • Knowledge base/articles

Video/Demo	Time
2.6.1 Troubleshooting Process	7:01
Total Video Time	**7:01**

Fact Sheets

2.6.2 Troubleshooting Process Facts

Number of Exam Questions

14 questions

Total Time

About 27 minutes

3.1: Cases and Form Factors

Lecture Focus Questions:

- Why must the case be matched to the motherboard?
- How does the ATX form factor differ from the ITX form factor?
- What are the characteristics of the ATX form factor?
- What is the main difference between a Micro-ATX tower and a Micro-ATX slim tower case?
- What is the most common ITX form factor?

Key terms for this section include the following:

Term	Definition
Motherboards	Adhere to design specifications called form factors.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.
	• Motherboard form factor
	  ○ ATX
	  ○ mATX
	  ○ ITX
	  ○ mITX

Video/Demo	Time
3.1.1 Cases and Form Factors	6:23
Total Video Time	**6:23**

Fact Sheets

3.1.2 System Case Facts

Number of Exam Questions

7 questions

Total Time

About 19 minutes

3.2: Power Supplies

Lecture Focus Questions:

- How does the case form affect the type of power supply you purchase?
- What is the function of the red toggle switch on a power supply? Why is this important?
- What rating determines the number of internal components a computer can handle?
- What is soft power?
- Why must you be careful when using a proprietary power supply?

In this section, you will learn to:

- Install a power supply

Key terms for this section include the following:

Term	Definition
SATA power	A power connector that has 15 pins and provides 3.3, 5, and 12 volts.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.1 Select and install PC components 1.1.1 Install and connect a power supply 3.2 Identify common connector types. • Molex
CompTIA 220-1001	3.7 Summarize power supply types and features. • Input 115V vs. 220V • Output 5.5V vs. 12V • 24-pin motherboard adapter • Wattage rating • Number of devices/types of devices to be powered

Video/Demo	Time
3.2.1 Power Supplies	4:10
3.2.3 Identify Power Supply Components	6:00
3.2.4 Change the Power Supply	7:16
Total Video Time	**17:26**

Lab/Activity

- 3.2.5 Install a Power Supply

Fact Sheets

- 3.2.2 Power Supply Facts

Number of Exam Questions

14 questions

Total Time

About 49 minutes

3.3: Motherboards and Buses

Lecture Focus Questions:

- What factors should you consider when selecting a motherboard?
- What chipset functionalities have moved to the CPU on newer systems?
- What are the basic steps of installing a motherboard?
- How can you add peripheral devices to a system?
- How are PCI and PCIe different?

In this section, you will learn to:

- Select an appropriate motherboard and install it in a desktop computer

Key terms for this section include the following:

Term	Definition
AC (alternating current)	The type of current distributed through wall sockets.
DC (direct current)	The type of current used inside a computer.
Motherboard	A circuit board that either houses or is connected to all of the components operating in the computer.
CPU socket	Houses the CPU.
Expansion slots	Allow you to expand the capabilities of your computer.
Firmware	Is stored on integrated flash memory, on a motherboard.
Chipset	A group of chips that facilitates communication between the processor, memory, and peripheral devices.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.1 Select and install PC components 1.1.2 Install and connect a motherboard 3.4 Given a scenario, select, install and configure storage devices.

CompTIA 220-1001	• Magnetic hard drives
	  ○ Sizes:
	  ▪ 2.5
	  ▪ 3.5
	
	3.5 Given a scenario, install and configure motherboards, CPUs, and add on cards.

- Motherboard connectors types
  - Front panel connector
  - Internal USB connector
- CMOS battery
- Expansion cards
  - Video cards
    - Onboard

Video/Demo	Time
3.3.1 Motherboard Components	4:19
3.3.3 Install a Motherboard	6:21
Total Video Time	**10:40**

Lab/Activity

- 3.3.5 Choose and Install a Motherboard

Fact Sheets

- 3.3.2 Motherboard Facts
- 3.3.4 Motherboard Installation Facts

Number of Exam Questions

14 questions

Total Time

About 47 minutes

3.4: Motherboard Troubleshooting

Lecture Focus Questions:

- What are the symptoms of system power problems? How do you troubleshoot system power problems?
- How do you interpret BIOS/UEFI error codes generated during POST?
- What are the symptoms of system overheating? How do you troubleshoot overheating issues?
- What are the symptoms of internal and external device failures? How do you troubleshoot internal and external device failures?

In this section, you will learn to:

- Troubleshoot system power issues

Key terms for this section include the following:

Term	Definition
Distended capacitors	Over time, the capacitors on the motherboard may become overstressed or overheated.
Overheating	When a computer's internal components generate heat that does not dissipate, harming the computer's functions and hardware.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	4.1 Troubleshoot hardware components 4.1.2 Troubleshoot system power 5.2 Given a scenario, troubleshoot problems related to motherboards, RAM, CPUs, and power.
CompTIA 220-1001	• Common symptoms ○ 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

Video/Demo	Time
3.4.1 Motherboard Troubleshooting	8:19
Total Video Time	**8:19**

Lab/Activity

- 3.4.3 Troubleshoot System Power
- 3.4.4 Troubleshoot Power Supply Problems

Fact Sheets

- 3.4.2 Motherboard Troubleshooting Facts

Number of Exam Questions

3 questions

Total Time

About 41 minutes

3.5: Processors

Lecture Focus Questions:

- What are the differences between the four levels of cache memory?
- What is the biggest limitation of using a 32-bit processor?
- What factors should be considered when comparing the speed of computers?
- What are the benefits of using a smaller processor size during CPU manufacture?
- What is the difference between hyper-threading and multithreading?
- Under what circumstances might you choose to use throttling?
- What is virtualization? Which CPU features enable advanced virtualization support?
- Which components are used with a CPU to dissipate heat?

In this section, you will learn to:

- Select and install a processor

Key terms for this section include the following:

Term	Definition
Multi-core	A processor that has multiple processors within a single processor package.
Throttling	The process of modifying the operating characteristics of a processor based on current conditions.
Overclocking	Pushing a CPU beyond its designed specifications.
Virtualization	The ability to install and run multiple operating systems simultaneously on a single physical machine.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.1 Select and install PC components 1.1.3 Install a CPU and CPU fan 3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.
CompTIA 220-1001	• CPU features ○ Single-core ○ Multicore ○ Virtual technology ○ Hyperthreading ○ Speeds ○ Overclocking ○ Integrated GPU

	• Motherboard connectors types
	  ○ Socket types
	• Compatibility
	  ○ AMD
	  ○ Intel

CompTIA 220-1002	1.1 Compare and contrast common operating system types and their purposes.
	• 32-bit vs. 64-bit
	  ○ RAM limitations
	  ○ Software compatibility

Video/Demo	Time
3.5.1 Processor Concepts	11:33
3.5.5 Install a Processor	6:35
Total Video Time	**18:08**

Lab/Activity

- 3.5.7 Select and Install a Processor 1
- 3.5.8 Select and Install a Processor 2

Fact Sheets

- 3.5.2 CPU Facts
- 3.5.3 CPU Performance Facts
- 3.5.4 CPU Socket Facts
- 3.5.6 CPU Installation Facts

Number of Exam Questions

15 questions

Total Time

About 78 minutes

3.6: Processor Troubleshooting

Lecture Focus Questions:

- How can you protect a CPU from electrostatic discharge?
- What could cause a system to not boot after installing a new CPU?
- What could cause a system to spontaneously shut down after it has been running for a period of time?
- What causes CPUs to fail prematurely?

In this section, you will learn to:

- Troubleshoot processor installation

Key terms for this section include the following:

Term	Definition
Failing CPU	System usually doesn't boot.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	4.1 Troubleshoot hardware components 4.1.3 Troubleshoot CPU installation

Video/Demo	Time
3.6.1 Processor Troubleshooting	6:18
Total Video Time	**6:18**

Lab/Activity

- 3.6.3 Troubleshoot Processor Installation 1
- 3.6.4 Troubleshoot Processor Installation 2

Fact Sheets

- 3.6.2 Processor Troubleshooting Facts

Number of Exam Questions

11 questions

Total Time

About 47 minutes

3.7: Memory

Lecture Focus Questions:

- What is the difference between SRAM and DRAM?
- What are two advantages of using DDR3 memory over DDR2 memory?
- What is the difference between SODIMM and UniDIMM?
- How does DDR4 differ from DDR3?
- What does the IMC do?

In this section, you will learn to:

- Classify different types of RAM
- Distinguish between different standards of DRAM

Key terms for this section include the following:

Term	Definition
Static RAM (SRAM)	Stores data using four transistors for every bit of data.
Dynamic RAM (DRAM)	Stores data using a single transistor for every bit of data.
DDR	Double-Data Rate Synchronous Dynamic RAM

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	3.3 Given a scenario, install RAM types.
	• RAM types
	  ○ SODIMM
	  ○ DDR2
	  ○ DDR3
	  ○ DDR4
	• Error correcting
	• Parity vs. non-parity

CompTIA 220-1002	1.7 Summarize application installation and configuration concepts. • System requirements ○ RAM

Video/Demo	Time
3.7.1 Random Access Memory	4:28
3.7.2 DRAM Types	6:13
3.7.4 Memory Speed	13:16

Total Video Time **23:57**

Fact Sheets

- 3.7.3 RAM Facts
- 3.7.5 Memory Speed Facts

Number of Exam Questions

12 questions

Total Time

About 46 minutes

3.8: Memory Installation

Lecture Focus Questions:

- Why is consulting the motherboard documentation so important when purchasing memory?
- You have DDR2 memory with a CAS latency of 6 and DDR3 memory with a CAS latency of 7. What can you tell about the relative speed of the two memory modules?
- What is the difference between ECC and registered memory?
- How does a triple-channel configuration and a quad-channel configuration differ?
- After installing the memory, what should you do?

In this section, you will learn to:

- Select and install the correct memory module.
- Install triple channel memory.

Key terms for this section include the following:

Term	Definition
Capacity	Refers to the storage capacity of the memory module.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.1 Select and install PC components 1.1.4 Install memory modules
CompTIA 220-1001	3.3 Given a scenario, install RAM types. • Single channel • Dual channel • Triple channel

Video/Demo	Time
3.8.1 Memory Characteristics	14:47
3.8.4 Select the Correct Memory Module	7:18
3.8.5 Install Memory	7:52
Total Video Time	**29:57**

Lab/Activity

- 3.8.3 Select Memory by Sight
- 3.8.7 Install Triple Channel Memory

Fact Sheets

- 3.8.2 Memory Facts
- 3.8.6 Memory Installation Facts

Number of Exam Questions
14 questions

Total Time
About 78 minutes

3.9: Memory Troubleshooting

Lecture Focus Questions:

- What does a memory error indicate?
- What are the symptoms of memory errors? How do you troubleshoot memory problems?
- What has happened when the system boots, but the memory count is incorrect?
- At which times might a memory problem manifest itself?

In this section, you will learn to:

- Troubleshoot memory

Key terms for this section include the following:

Term	Definition
Memory Errors	Memory errors usually indicate a failing module or discrepancies between new and old memory.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	4.1 Troubleshoot hardware components 4.1.4 Troubleshoot system memory
CompTIA 220-1001	5.2 Given a scenario, troubleshoot problems related to motherboards, RAM, CPUs, and power. • Common symptoms ○ Log entries and error messages
CompTIA 220-1002	1.5 Given a scenario, use Microsoft operating system features and tools. • Administrative ○ Windows Memory

Video/Demo	Time
3.9.1 Memory Troubleshooting	6:35
3.9.2 Test Memory	4:26
Total Video Time	**11:01**

Lab/Activity

- 3.9.4 Troubleshoot Memory 1
- 3.9.5 Troubleshoot Memory 2

Fact Sheets

- 3.9.3 Memory Troubleshooting Facts

Number of Exam Questions

10 questions

Total Time

About 51 minutes

3.10: BIOS/UEFI

Lecture Focus Questions:

- What are the functions of the BIOS?
- What is the role of CMOS? How does it differ from the BIOS?
- Why does the CMOS require a battery?
- What might be some common reasons for editing the CMOS settings?
- What determines the keystroke to open a CMOS editor? How can you find this information?
- What functions are performed in the POST process?

In this section, you will learn to:

- Find and edit BIOS settings
- Clear CMOS settings

Key terms for this section include the following:

Term	Definition
Unified Extensible Firmware Interface (UEFI)	I/O firmware that will, eventually, completely replace BIOS.
Basic Input Output System (BIOS)	Firmware that controls input and output operations.
Electrically Erasable Programmable Read-Only Memory (EEPROM)	A RAM chip that replaced the CMOS chip.
Complementary Metal-Oxide Semiconductor (CMOS)	A technology for constructing integrated circuits.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.2 Configure hardware components 1.2.2 Configure BIOS/UEFI settings 3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.

CompTIA 220-1001	• BIOS/UEFI settings
	  ○ Boot options
	  ○ Security
	  ○ Drive encryption
	  ○ TPM
	  ○ LoJack

- Secure boot

Video/Demo	Time
3.10.1 BIOS/UEFI	12:03
3.10.2 PC Boot Process	4:05
3.10.4 Edit BIOS/UEFI Settings	14:35
3.10.5 Use Built-in System Diagnostics	2:37
3.10.6 Flash the BIOS	6:21
Total Video Time	**39:41**

Lab/Activity

- 3.10.7 Find BIOS/UEFI Settings
- 3.10.8 Clear CMOS Settings

Fact Sheets

- 3.10.3 BIOS/UEFI Facts

Number of Exam Questions

14 questions

Total Time

About 83 minutes

3.11: Expansion Cards

Lecture Focus Questions:

- What advantage does a PCIe bus have over a PCI bus?
- Which type of devices typically use mini PCI cards?
- Which bus type is commonly used by graphics cards?
- What type of slot can a PCIe x1 expansion card be placed in?

In this section, you will learn to:

- Install an expansion card

Key terms for this section include the following:

Term	Definition
Peripheral Component Interconnect (PCI)	A connection slot for a 32-bit computer bus.
PCI Extended (PCI-X)	A PCI design that overcomes PCI bandwidth limitations.
PCI Express (PCIe)	The connector that replaced PCI, PCI-X and AGP.
Mini PCI	A small form factor used by computers.
Legacy Bus	An old bus no longer supported by manufacturers.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.1 Select and install PC components 1.1.5 Select and install expansion cards 3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.

CompTIA 220-1001	• Motherboard connectors types
	  ○ PCI
	  ○ PCIe
	  ○ Riser card

Video/Demo	Time
3.11.1 Expansion Buses and Slots	4:30
3.11.3 Install an Expansion Card	4:18
Total Video Time	**8:48**

Lab/Activity

- 3.11.4 Install Expansion Cards

Fact Sheets

- 3.11.2 Expansion Bus Types

Number of Exam Questions

3 questions

Total Time

About 29 minutes

3.12: Video

Lecture Focus Questions:

- How does the video card affect the quality of the image on the monitor?
- Which type of DVI connector sends digital signals only?
- How does the GPU increase the video performance?
- What are the differences between integrated graphics and dedicated video cards?
- What advantages are provided by SLI and CrossFire?
- What is the general function of HDCP? When should you be concerned with an HDCP video card or monitor?

In this section, you will learn to:

- Select the appropriate video card for a computer system
- Upgrade a video card

Key terms for this section include the following:

Term	Definition
Display connectors	Connectors that attach to different displays like VGA, DVI-I, HDMI, DisplayPort.
Display quality	The resolution, refresh rate.
Processing capabilities	The capacity of the graphics processing unit (GPU).
Memory	DDR, DDR2, DDR3, GDDR2, GDDR3, GDDR5.
Bus type	PCIe x16, PCI, AGP, VESA.
Multi-GPU	SLI, CrossFire.
HDMI audio	HDTV out, onboard sound.
DirectX/openGL	A collection of APIs that improves graphic, animation, and multimedia creations.
TV Input/output	S-video, HDMI, VGA, DVI and connectors.
High-bandwidth Digital Content Protection (HDCP)	A digital copy form designed to protect digital media from piracy.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	3.1 Explain basic cable types, features, and their purposes.
	• Video cables
	  ○ VGA
	  ○ DVI
	  ○ HDMI

- Mini-HDMI
- DisplayPort
- DVI-D, DVI-I

3.2 Identify common connector types.

- BNC

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

- Expansion cards
  - Video cards

3.6 Explain the purposes and uses of various peripheral types.

- Monitors

Video/Demo	Time
3.12.1 Video Cards	5:32
3.12.3 Install a Video Card	6:12
Total Video Time	**11:44**

Lab/Activity

- 3.12.5 Upgrade a Video Card

Fact Sheets

- 3.12.2 Video Card Facts
- 3.12.4 Video Card Installation Facts

Number of Exam Questions

15 questions

Total Time

About 49 minutes

3.13: Audio

Lecture Focus Questions:

- What do you need to do to play AIFF files on a Windows computer?
- What color typically indicates the speaker port on a sound card? What color is used for the microphone?
- Which connectors are used for digital S/PDIF audio?
- Which encoding techniques are used for surround sound audio?

In this section, you will learn to:

- Select and install a sound card

Key terms for this section include the following:

Term	Definition
Sound card	An expansion card that manages sound input and output.
ADC	An analog-to-digital converter.
DSP	A digital signal processor.
DAC	A digital-to-analog converter.
Sampling rate	A number of analog signal samples taken in over a period of time.
Feature support	DirectSound 3D, EAX, THX, Dolby Digital, DTS, SDDS, MIDI.
Analog output	An output that allows sound to be played through external devices.
Analog input	An input that allows audio to be recorded through the sound card.
Audio file types	WAV, AIFF, AU, MP3, AAC, WMA, MIDI.
I/O	Acronym for input/output.
Mini TRS	A port that accepts 3.5mm plugs for analog audio I/O.
TOSLINK	A digital optical I/O for S/PDIF audio.
RCA	A coaxial digital I/O for S/PDIF audio.
IEEE 1394	A FireWire port.
HDMI	A port that sends HD audio to an HDMI device.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.1 Install, update, and configure an operating system 2.1.6 Manage audio device settings
CompTIA 220-1001	3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards. • Expansion cards

CompTIA 220-1002	○ Sound cards 3.6 Explain the purposes and uses of various peripheral types. • Speakers 1.6 Given a scenario, use Microsoft Windows Control Panel utilities. • Sound

Video/Demo	Time
3.13.1 Digital Audio	9:07
3.13.2 Sound Cards	3:35
3.13.4 Manage Audio Devices	11:22
Total Video Time	**24:04**

Lab/Activity

- 3.13.7 Select and Install a Sound Card

Fact Sheets

- 3.13.3 Sound Card Facts
- 3.13.5 Sound Card Installation Facts
- 3.13.6 Sound Card Connectors

Number of Exam Questions

13 questions

Total Time

About 65 minutes

3.14: Cooling

Lecture Focus Questions:

- How does adequate cooling improve performance and extend the life of components?
- How does organizing and attaching cables and wires in and around a computer system help with internal airflow?
- Why should you keep the system case cover on during normal operations?
- Why is it important that case fans are installed properly?
- When might you want to add liquid cooling to a computer?
- What is the difference between an active heat sink and a passive heat sink?
- What is the function of thermal paste? When should it be used?

Key terms for this section include the following:

Term	Definition
Case fan	Fans that create a pressurized system that allows air to flow through the computer case in a specific way.
Heat sink	A hardware component made of heat conductive material.
Heat sensors	Computers have several heat sensors, including the CPU sensor, system case sensor, and room temperature sensor.
Liquid cooling	An additional cooling agent used when air cooling is not enough.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.
	
	• Cooling mechanism
	  ○ Fans
	  ○ Heat sink
	  ○ Liquid
	  ○ Thermal paste

Video/Demo	Time
3.14.1 System Cooling	7:55
Total Video Time	**7:55**

Fact Sheets

3.14.2 System Cooling Facts

Number of Exam Questions

11 questions

Total Time
About 24 minutes

4.1: Peripheral Devices

Lecture Focus Questions:

- What are the three types of peripheral devices?
- Which connector is used by most peripheral devices?
- Which peripheral devices require little to no configuration?
- How can you verify that a device is compatible with a particular computer?
- Which peripheral devices require special software or drives to function?
- What is the difference between an input device and an output device?

In this section, you will learn to:

- Understand the various functions of different peripheral devices
- Connect a KVM to multiple computers
- Connect peripheral devices using the appropriate cables and connectors

Key terms for this section include the following:

Term	Definition
Digitizer	A device that captures an analog signal and turns it into digital data. Examples include graphics tables, document scanners, and 3D scanners.
Input device	A device that sends data to a computer.
Input & output (I/O) device	A device that can input data to a computer and accept output data from a computer. Example include CD-ROMs, DVD-ROMS, USB flash drives, hard disk drives, network adapters, and Bluetooth adapters.
KVM (keyboard, video, mouse) switch	A switch that allows multiple computers to use a single keyboard, mouse, and monitor.
Lumen	A unit of measurement that indicates an amount of light.
Near-field communication (NFC)	A set of communication protocols that allow devices to communicate when they are within 1.6 inches of one another. NFC devices are commonly used in retail stores and restaurants with Tap Pay phone apps.
Output device	A device used to send or display data from a computer.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1001	1.2 Given a scenario, install components within the display of a laptop. • Types

	○ LCD 3.6 Explain the purposes and uses of various peripheral types. • KVM • VR headset • Mouse • Keyboard • ADF/flatbed scanner • Barcode scanner/QR scanner • Game controllers • Touchpad • Camera/webcam • Microphone • Signature pad • Magnetic reader/chip reader • NFC/tap pay device • Projector ○ Lumens/brightness ○ OLED 4.1 Compare and contrast best practices associated with types of documentation. • Inventory management ○ Barcodes
CompTIA 220-1002	

Video/Demo	Time
4.1.1 Peripheral Devices	3:26
Total Video Time	**3:26**

Lab/Activity

4.1.3 Connect a KVM Switch

Fact Sheets

4.1.2 Peripheral Device Facts

Number of Exam Questions

6 questions

Total Time

About 27 minutes

4.2: USB

Lecture Focus Questions:

- What are the differences between USB 2.0 and 3.0?
- Which types of devices are typically self-powered? Which types are typically bus-powered?
- What are the power requirements for low and high-powered bus powered devices?
- What is the difference between a microUSB connector and a miniUSB connector?
- How can you identify a USB 3.0 port and connector?
- What is the purpose of USB Type-C connectors?

In this section, you will learn to:

- Identify typical USB connectors and ports
- Connect USB peripheral devices (including storage devices, printers, smartphones)
- Select and install USB devices based on customer requirements

Key terms for this section include the following:

Term	Definition
Bus-powered	A device that runs on power it receives from another device through a USB port.
Hot plugging	The act of adding or removing devices to a system without rebooting.
Self-powered	A device that runs on power from a wall outlet.
Universal Serial Bus (USB)	The most commonly used connection interface.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.3 Install and configure storage 1.3.1 Install internal and external storage devices 3.1 Explain basic cable types, features, and their purposes.

CompTIA 220-1001	• Multipurpose cables
	  ○ USB
	  ○ USB-C
	  ○ USB 2.0

- USB 3.0

3.2 Identify common connector types.

- USB
- Micro-USB
- Mini-USB
- USB-C

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

- Expansion cards
  - USB expansion card

3.6 Explain the purposes and uses of various peripheral types.

- External storage drives

Video/Demo	Time
4.2.1 Universal Serial Bus (USB)	6:51
Total Video Time	**6:51**

Lab/Activity

4.2.3 Install USB Devices

Fact Sheets

4.2.2 USB Facts

Number of Exam Questions

12 questions

Total Time

About 36 minutes

4.3: Display Devices

Lecture Focus Questions:

- What are some of the specifications used by display devices?
- What are the benefits of a higher resolution?
- What is the refresh rate?

In this section, you will learn to:

- Identify digital and analog connectors by sight
- Select the appropriate display device based on customer requirements and system support
- Configure display properties (including dual monitor support) in Windows, macOS, and Linux

Key terms for this section include the following:

Term	Definition
Color depth	The number of bits used for each color component of a single pixel.
Resolution	A measurement of an image's sharpness and clarity. The more pixels that make up an image, the higher its resolution.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	1.6 Given a scenario, use Microsoft Windows Control Panel utilities.
	
	• Display/Display Settings
	  ○ Resolution
	  ○ Color depth
	  ○ Refresh rate

Video/Demo	Time
4.3.1 Configure Display Settings in Windows	6:03
4.3.2 Configure Advanced Display Settings in Windows	8:40
4.3.4 Configure Display Settings in Linux	3:37
4.3.5 Configure Display Settings in macOS	6:10
Total Video Time	**24:30**

Lab/Activity

- 4.3.3 Select and Configure Dual Monitors

Fact Sheets

- 4.3.6 Display Device Facts

Number of Exam Questions

13 questions

Total Time

About 55 minutes

4.4: Video Troubleshooting

Lecture Focus Questions:

- What components comprise the video system in a PC?
- What can cause no output on a video monitor?
- The output on a video monitor is displayed in VGA mode. What could cause this?
- A monitor suddenly shuts off during use. What could cause this?
- What can cause the output of an LCD to look pixilated and chunky?
- What are some causes of a dim LCD screen?
- What setting can be changed to stop an LCD from flickering?
- How can you remove image retention on a plasma display?
- An LCD monitor has dead and stuck pixels. How can you fix this issue?
- What setting can affect the size of images and icons?

In this section, you will learn to:

- Troubleshoot monitors with no display
- Troubleshoot monitors displaying in VGA mode
- Troubleshoot monitor thermal shutdown
- Determine the native resolution for an LCD monitor
- Troubleshoot backlight issues on LCD monitors
- Fix dead or stuck pixels on an LCD monitor
- Reduce remote image retention (burn-in)

Key terms for this section include the following:

Term	Definition
Artifact	Part of an image that stays on-screen after the rest of the image has left.
Burn-in	Also known as image retention (IR), burn-in is when an image is displayed on a screen for too long and becomes permanently stuck.
Codec	A file format.
Video Graphics Array (VGA) mode	A simplified startup mode that can help you troubleshoot video card issues that interrupt Windows OS functions.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.1 Install, update, and configure an operating system 2.1.5 Configure and optimize video adapter settings
CompTIA 220-1001	3.6 Explain the purposes and uses of various peripheral types.

- Projector
  - Lumens/brightness

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

- Common symptoms
  - 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

Video/Demo	Time
4.4.1 Video Troubleshooting	8:52
Total Video Time	**8:52**

Fact Sheets

4.4.2 Video Troubleshooting Facts

Number of Exam Questions

12 questions

Total Time

About 26 minutes

4.5: Device Driver Management

Lecture Focus Questions:

- What type of hardware devices use DMA channels to communicate directly with RAM?
- When is is necessary to manually configure a device?
- What system rights are required to install devices?
- What is the function of the driver?
- What is the importance of driver signing? What should you be aware of when using a driver that is not signed?
- How do you safely remove a hot swappable component?
- How do you verify that a device is compatible with the version of Windows you are running before you purchase it?
- Where are the best places to obtain the most up-to-date version of a driver for each of the following: a Windows system, a macOS system, and a Linux system?

In this section, you will learn to:

- Install devices using drivers included with Windows and drivers available on disc
- Use Device Manager to verify the proper installation of devices
- Safely remove hot swappable devices
- Configure Windows to search Windows Update for updated drivers
- Configure driver signing behavior in Windows
- Update device drivers
- Install and configure drivers on Linux and macOS systems

Key terms for this section include the following:

Term	Definition
Direct Memory Access (DMA)	Conduits used by high-speed devices to bypass the CPU and communicate directly with RAM.
Driver	A program that enables the operating system to interact with hardware devices.
Hot swappable device	A device that can be added and removed without shutting down the computer. For example, thumb drives are hot swappable.
Interrupt Request (IRQ)	A communication method that allows a device to to interrupt the CPU and request processing time.
Input/Output Address (I/O Address)	A data address that allows two devices in a computer to send information to each other.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.1 Install, update, and configure an operating system

	2.1.4 Manage device drivers 2.5 Summarize the properties and purposes of services provided by networked hosts. • Legacy/embedded systems
CompTIA 220-1001	3.4 Given a scenario, select, install and configure storage devices. • Configurations ○ Hot swappable

CompTIA 220-1002	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
	
	1.6 Given a scenario, use Microsoft Windows Control Panel utilities.
	
	• Device Manager
	
	1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.
	
	• Best practices
	  ○ Driver/firmware updates

Video/Demo **Time**

4.5.1 Device Installation	4:19
4.5.2 Install Device Drivers	10:30
4.5.3 Manage Device Drivers on Windows	12:46
4.5.4 Manage Devices on Linux	12:24
4.5.5 Manage Devices on macOS	2:50
Total Video Time	**42:49**

Lab/Activity

- 4.5.8 Manage Devices

Fact Sheets

- 4.5.6 Hardware Device Facts
- 4.5.7 Device Driver Installation Facts

Number of Exam Questions

14 questions

Total Time

About 79 minutes

4.6: Device Driver Troubleshooting

Lecture Focus Questions:

- What are the first items you should check when you have installed a new device and it is not working properly?
- How do you verify that a device is recognized and enabled in Device Manager?
- What should you do if the system crashes during startup before you can log on?
- If you cannot boot the system into Safe Mode, what steps should you take to boot the system?
- Once you get a system started after reducing it to a minimal state, how do you identify a component that has a problem?

In this section, you will learn to:

- Update and roll back device drivers
- Enable and disable devices in Device Manager
- Use the Last Known Good configuration, Safe Mode, and restore points to recover from device-related errors
- Update hardware device firmware

Key terms for this section include the following:

Term	Definition
Roll back	Revert a system that has received an update or other change to its previous state.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	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

3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.

- Common solutions
  - Roll back updates
  - Roll back devices drivers

Video/Demo	Time
4.6.1 Device Driver Troubleshooting	4:57
4.6.2 Troubleshoot Devices	6:30
Total Video Time	**11:27**

Lab/Activity

- 4.6.4 Manage Devices 1
- 4.6.5 Manage Devices 2

Fact Sheets

- 4.6.3 Device Troubleshooting Facts

Number of Exam Questions

13 questions

Total Time

About 54 minutes

5.1: Storage Devices

Lecture Focus Questions:

- What are the advantages of hard disks over all other forms of storage media?
- How do optical drives store and read data from a disc?
- How does a flash device differ from a hard disk?
- Which storage device types are magnetic media? Which are optical? Which are solid state?

In this section, you will learn to:

- Select the appropriate storage solution

Key terms for this section include the following:

Term	Definition
Flash memory	Electronic non-volatile memory that is easy to erase and reprogram.
Hard disk	A long-term storage device; a thick magnetic disk made of several aluminum platters in a protective shell.
Integrated Drive Electronics (IDE)	An electronic interface that allows communication between a motherboard's data pathos or bus and a computer's hard disks.
Non-Volatile Memory Express (NVMe)	A memory storage device designed to allow access to non-volatile storage media through a PCI express (PCIe) bus.
Optical disc	A storage device that records binary information through pits in a reflectively-coated disc. Optical discs use lasers for reading and writing information.
M.2	A popular solid state drive often used in portable electronics.
SD card	A flash memory device is often used in digital cameras.
Solid state drive	A flash device with a large storage capacity comparable to a hard disk drive's.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	1.1 Given a scenario, install and configure laptop hardware and components.
	• Hardware/device replacement
	  ○ Hard drive
	  ▪ SSD vs. hybrid vs. magnetic disk

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

- Solid-state drives
  - M2 drives
  - NVME
- Hybrid drives
  - Flash
  - SD card
  - CompactFlash
  - Micro-SD card
  - Mini-SD card
  - xD

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

- Motherboard connectors types
  - IDE

Video/Demo	Time
5.1.1 Storage Devices	8:38
Total Video Time	**8:38**

Fact Sheets

5.1.2 Storage Device Facts

Number of Exam Questions

9 questions

Total Time

About 23 minutes

5.2: SATA

Lecture Focus Questions:

- What enhancements does SATA2 provide that the original SATA specifications do not?
- What is eSATA? When would you use it?
- What are two ways to configure a SATA2 drive with a system that only supports SATA1?
- How does SATA2 differ from SATA3?
- What advantage does eSATAp have over eSATA?

In this section, you will learn to:

- Install SATA devices

Key terms for this section include the following:

Term	Definition
External Serial Advanced Technology Attachment (eSATA)	An extension to the SATA standard that enables SATA drives to attach externally.
Serial ATA (SATA)	The latest generation of standards for hard disk and other storage devices.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.3 Install and configure storage 1.3.1 Install internal and external storage devices

CompTIA 220-1001	3.1 Explain basic cable types, features, and their purposes.
	• Hard drive cables
	  ○ SATA
	3.2 Identify common connector types.
	• eSATA
	3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.
	• Motherboard connectors types
	  ○ SATA
	• Expansion cards

- eSATA card

Video/Demo	Time
5.2.1 SATA	7:36
5.2.2 Install a SATA Device	6:03
Total Video Time	**13:39**

Lab/Activity

- 5.2.4 Install SATA Devices

Fact Sheets

- 5.2.3 SATA Installation Facts

Number of Exam Questions

7 questions

Total Time

About 38 minutes

5.3: Optical Media

Lecture Focus Questions:

- How much data does a CD typically hold? How much data does a DVD hold? How much data does a Blu-ray disc hold?
- An optical drive speed is identified as 24x10x70. What does each of the numbers indicate?
- A DVD drive and a Blu-ray drive can both read data at 4x speeds. How do the drive's speed compare to the amount of data that can be transferred?
- How are Blu-ray drives made compatible with CD, DVD, and Blu-ray discs?
- What is the difference between BD-R and BD-RE discs?
- Which type of connector attaches an optical drive to the motherboard?

Key terms for this section include the following:

Term	Definition
Optical drive	The disc drive that reads and writes data from optical media.
Optical media	Discs that are easily portable and can store large amounts of data.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	3.4 Given a scenario, select, install and configure storage devices.
	
	• Optical drives
	  ○ CD-ROM/CD-RW
	  ○ DVD-ROM/DVD-RW/DVD-RW DL
	  ○ Blu-ray
	  ○ BD-R
	  ○ BD-RE
	
	3.6 Explain the purposes and uses of various peripheral types.
	
	• Optical
	• DVD drive

Video/Demo	Time
5.3.1 CD Drives	5:25
5.3.2 DVD Drives	5:27
5.3.3 Blu-ray	3:49
Total Video Time	**14:41**

Fact Sheets

5.3.4 Optical Media Facts

Number of Exam Questions
6 questions

Total Time
About 26 minutes

5.4: RAID

Lecture Focus Questions:

- How do striping and mirroring differ?
- What is parity?
- How does a RAID 0 configuration improve disk read and write performance?
- With a RAID 0 configuration, what happens to your data if a drive in the set fails?
- What is the minimum number of disks required for a RAID 5 configuration?
- What advantages does RAID 5 have over RAID 1?
- How do RAID 5 and RAID 10 differ?

In this section, you will learn to:

- Create RAID arrays
- Implement a RAID solution

Key terms for this section include the following:

Term	Definition
Redundant Array of Independent Disks (RAID)	A disk sub-system that combines multiple physical disks into a single logical storage unit.
Just a Bunch of Disks (JBOD)	A configuration that places multiple disks in a single logical storage unit.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.3 Install and configure storage 1.3.3 Implement a RAID solution
CompTIA 220-1001	3.4 Given a scenario, select, install and configure storage devices. • Configurations ○ RAID 0, 1, 5, 10

Video/Demo	Time
5.4.1 RAID	11:05
5.4.3 Configure a RAID Array	9:23
Total Video Time	**20:28**

Lab/Activity

- 5.4.5 Create RAID Arrays
- 5.4.6 Implement a RAID Solution

Fact Sheets

- 5.4.2 RAID Facts
- 5.4.4 RAID Configuration Facts

Number of Exam Questions

14 questions

Total Time

About 69 minutes

5.5: File Systems

Lecture Focus Questions:

- What is the difference between a partition and a volume?
- What advantages does NTFS provide over FAT32?
- Why should you back up all data before formatting a drive?
- How can you reformat a drive from FAT to NTFS without losing all of the data?
- How would you convert a drive from NTFS to FAT32?
- Which operating systems can use NTFS?

Key terms for this section include the following:

Term	Definition
Directory	A container in a volume that holds files or other directories.
Extended File Allocation Table (ExFAT or FAT32)	A special file system designed to support large flash drives.
File	A file is a one-dimensional stream of bits treated as a logical unit. They are the most basic component that a file system uses to organize raw bits of data on the storage device itself. The filename is made up of the directory path plus the file name. An extension can also be added to the filename to identify the file type and the program used to create, view, and modify the file.
File system	A means for organizing and storing data and information on a storage device.
Formatting	The process of preparing a partition to use a specific file system.
New Technology File System (NTFS)	Microsoft's default file system.
Volume	A single accessible storage area within a file system.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.2 Use operating system features and utilities 2.2.2 Use core macOS or iOS features 1.3 Summarize general OS installation considerations and upgrade methods.
CompTIA 220-1002	• File system types/formatting ○ ExFAT ○ FAT32 ○ NTFS ○ CDFS

    - NFS
    - ext3, ext4
    - Quick format vs. full format
- Partitioning
- Dynamic
- Basic
- Primary
- Extended
- Logical
- GPT

Video/Demo	Time
5.5.1 Partitions, Volumes, and File Systems	3:58
5.5.2 View File System Components	8:38
5.5.4 MBR Partitioning	14:43
5.5.6 GPT Partitioning	4:05
Total Video Time	**31:24**

Fact Sheets

- 5.5.3 File System Facts
- 5.5.5 MBR Partitioning Facts
- 5.5.7 GPT Partitioning Facts

Number of Exam Questions

14 questions

Total Time

About 61 minutes

5.6: File System Creation

Lecture Focus Questions:

- Which tools can you use to create a volume?
- What does the Unknown status on a disk mean?
- What does the No Media status tell you?
- What is the difference between the Online status and the Online (Errors) status?

In this section, you will learn to:

- Create volumes
- Format and convert drives

Key terms for this section include the following:

Term	Definition
Initialize	Prepare a new disk for use.
Partition	A section of a hard disk separate from the rest. Partitions allow the operating system to manage the information in each section separately.
Storage Spaces	A Windows technology that helps prevent drive failures by allowing you to group drives into a storage pool and make data backups.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

TestOut PC Pro	1.3 Install and configure storage
	1.3.2 Configure and manage storage
	
	1.3 Summarize general OS installation considerations and upgrade methods.
	
	• Partitioning
	  ○ Dynamic
	  ○ Basic
	  ○ Primary
	  ○ Extended
	  ○ Logical

CompTIA 220-1002	1.4 Given a scenario, use appropriate Microsoft command line tools. • gpupdate • gpresult

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

- Disk Management
  - Drive status
  - Mounting
  - Initializing
  - Extending partitions
  - Splitting partitions
  - Shrink partitions
  - Assigning/changing drive letters
  - Adding drives
  - Adding arrays
  - Storage spaces

Video/Demo	Time
5.6.1 Create Volumes with Disk Management	13:36
5.6.2 Create Volumes with Diskpart	6:42
5.6.4 Convert Volumes	9:36
Total Video Time	**29:54**

Lab/Activity

- 5.6.3 Create Volumes
- 5.6.5 Format Drives

Fact Sheets

- 5.6.6 Disk Status Facts

Number of Exam Questions

9 questions

Total Time

About 68 minutes

5.7: Storage Management

Lecture Focus Questions:

- What are the requirements for creating a mount point?
- Which types of volumes support mount points?
- What are the prerequisites for extending a volume on a basic disk?
- What advantages do dynamic disks provide when extending volumes?
- What is the difference between an extended volume and a spanned volume?

In this section, you will learn to:

- Mount a partition to a folder
- Extend existing volumes

Key terms for this section include the following:

Term	Definition
Extended volume	An extended volume has unallocated disk space on the same disk.
Mount point	A mount point is an empty folder on an existing volume that points to another partition. Data saved to the folder is physically saved on the referenced partition.
Spanned volume	A spanned volume has unallocated disk space on a different disk.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.3 Install and configure storage 1.3.2 Configure and manage storage 1.5 Given a scenario, use Microsoft operating system features and tools.
CompTIA 220-1002	• Disk Management ○ Drive status ○ Mounting ○ Initializing ○ Extending partitions ○ Splitting partitions ○ Shrink partitions ○ Assigning/changing drive letters ○ Adding drives ○ Adding arrays

- Storage spaces

Video/Demo	Time
5.7.1 Add Storage	6:30
5.7.2 Create Mount Points and Extending Volumes	11:17
5.7.3 Shrink and Split Partitions	3:09
Total Video Time	**20:56**

Lab/Activity

- 5.7.5 Add Space to Existing Volumes

Fact Sheets

- 5.7.4 Storage Management Facts

Number of Exam Questions

6 questions

Total Time

About 44 minutes

5.8: Storage Spaces

Lecture Focus Questions:

- What components are used to create storage spaces?
- What is the difference between a storage pool and a storage space?
- Which hardware devices can be used to make storage pools?
- What are the benefits of using storage pools?
- You are comparing the hardware required for two-way mirroring and three-way mirroring. What is the minimum number of disks required for each data resiliency type?
- How does thin provisioning allow you to allocate more storage space to users than is available in the pool?

In this section, you will learn to:

- Implement storage spaces

Key terms for this section include the following:

Term	Definition
Storage Space	A Windows function that allows you to group physical disks into storage pools and create virtual disks from the available capacity.
Parity	Parity requires that you have at least three storage devices. It uses parity information to reconstruct data if one of the storage devices fails. Parity uses less space for redundancy than the mirror options, but performance is not as good as the mirror options if a device failure occurs. Parity requires only 50 percent more redundancy space than storage space.
Simple data Provisioning	This option simply adds space from the storage pool to the storage space. When you select the Simple option, all of the data in the storage space is lost if one of the drives fails.
Thin provisioning	An option that allows you to allocate larger storage spaces than the disk space available in the pool.
Three-way mirror	Three-way mirror requires at least five storage devices. The data is written to three storage devices. This option provides redundancy for the data if two storage devices fail at one time.
Two-way mirror	Two-way mirror requires at least two storage devices. The data is written to two devices. Two-way mirror requires twice as much device space as the amount of storage allocated to the storage space. This option protects you from a single storage device failure.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.3 Install and configure storage

CompTIA 220-1002	1.3.2 Configure and manage storage
	
	1.5 Given a scenario, use Microsoft operating system features and tools.
	
	• Disk Management
	  ○ Drive status
	  ○ Mounting
	  ○ Initializing
	  ○ Extending partitions
	  ○ Splitting partitions
	  ○ Shrink partitions
	  ○ Assigning/changing drive letters
	  ○ Adding drives
	  ○ Adding arrays
	  ○ Storage spaces

Video/Demo	Time
5.8.1 Storage Spaces	9:31
5.8.2 Create Storage Spaces	9:59
Total Video Time	**19:30**

Lab/Activity

- 5.8.4 Implement Storage Spaces

Fact Sheets

- 5.8.3 Storage Space Facts

Number of Exam Questions

5 questions

Total Time

About 42 minutes

5.9: Disk Optimization

Lecture Focus Questions:

- What tasks does Disk Cleanup perform?
- Why does fragmentation take place? How does defragmenting improve how a system performs?
- How is a lost cluster different from a cross-linked file?
- Which utility could you use to detect and mark bad clusters?

In this section, you will learn to:

- Perform disk cleanup
- Defragment a hard disk
- Check a hard disk for errors

Key terms for this section include the following:

Term	Definition
Disk Defragmenter	A program that optimizes the performance of your hard drive by joining fragments of files that are in different locations on your hard drive into a single location.
System Restore	a Microsoft feature that lets your revert a computer's state to a previous period in time.
Windows Update	A program that updates your Windows operating system.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.3 Install and configure storage 1.3.4 Perform disk maintenance 3.4 Given a scenario, select, install and configure storage devices.

CompTIA 220-1001	• Magnetic hard drives
	  ○ 5,400rpm
	  ○ 7,200rpm
	  ○ 10,000rpm
	  ○ 15,000rpm

CompTIA 220-1002	1.5 Given a scenario, use Microsoft operating system features and tools. • System utilities ○ Regedit

- Command
- Services.msc
- MMC
- MSTSC
- Notepad
- Explorer
- Msinfo32
- DxDiag
- Disk Defragmenter
- System Restore
- Windows Update

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

- Best practices
  - Scheduled disk maintenance
- Tools
  - Disk maintenance utilities

3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.

- Common solutions
  - Defragment the hard drive

Video/Demo	Time
5.9.1 Storage Optimization	12:46
5.9.2 Optimize Disks in Windows	13:21
5.9.3 Optimize Disks in Linux	8:13
5.9.4 Optimize Disks in macOS	5:03
Total Video Time	**39:23**

Lab/Activity

5.9.6 Perform Disk Maintenance

Fact Sheets

5.9.5 Disk Optimization Facts

Number of Exam Questions

9 questions

Total Time

About 66 minutes

5.10: Storage Troubleshooting

Lecture Focus Questions:

- A hard disk is performing slowly. What can you do to speed up its performance?
- A system fails to boot, displaying an *Operating System Not Found* error message. What could be causing this issue?
- A hard disk connected to the motherboard is not recognized by the BIOS/UEFI firmware. What is causing this issue?
- A hard disk is making noise. What should you do?
- A computer system has an SSD drive installed. What should you do to optimize the useable lifespan of this device?

In this section, you will learn to:

- Optimize hard disk performance
- Troubleshoot boot failures
- Troubleshoot problems with storage device boot priority in the BIOS/UEFI firmware
- Troubleshoot SATA drive issues
- Optimize SSD storage devices

Key terms for this section include the following:

Term	Definition
Basic Input/Output System (BIOS)	Firmware that initializes hardware at startup and provides runtime services to the operating system.
Defragmentation	Reducing file fragments by grouping file pieces on a hard drive together.
Mean time before failure (MTBF)	A measurement of a hardware component's reliability generally stated in hours or thousands of hours.
TRIM	An SSD function that configures the operating system to communicate with an SSD device and tell it which blocks of data on the device are no longer required and can be deleted.
Unified Extensible Firmware Interface (UEFI)	A software program specification that connects firmware to the operating system. UEFI is eventually expected to replace BIOS.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1001	5.3 Given a scenario, troubleshoot hard drives and RAID arrays. • Common symptoms ○ Read/write failure

CompTIA 220-1002	○ 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 3.1 Given a scenario, troubleshoot Microsoft Windows OS problems. • Common symptoms ○ Failure to boot ○ No OS found ○ Application crashes ○ Blue screens

Video/Demo	Time
5.10.1 Storage Troubleshooting	7:56
5.10.3 SSD Storage Issues	4:26
Total Video Time	**12:22**

Lab/Activity

- 5.10.5 Troubleshoot SATA Devices

Fact Sheets

- 5.10.2 Storage Troubleshooting Facts
- 5.10.4 SSD Maintenance Facts

Number of Exam Questions

15 questions

Total Time

About 50 minutes

6.1: Networking Overview

Lecture Focus Questions:

- In what ways does a network benefit a company? What is the main drawback to implementing a network?
- Why are protocols important for networking?
- What are the advantages of a client/server network when compared to a peer-to-peer network?
- What factor usually causes LANs to have a higher bandwidth than WANs?

Key terms for this section include the following:

Term	Definition
Network	Computer system controlled by a single organization.
Subnet	A portion of a network with a common network address.
Nodes or hosts	Computers.
Transmission media	Path for electrical signals between devices.
Network Interfaces	Devices that send and receive electrical signals.
Protocols	Rules or standards that describe how hosts communicates and exchange data.
Peer-to-peer	Network in which all hosts share all resources.
Client-server	Network in which hosts have specific roles.
PAN	Small network for communication between devices.
LAN	Small geographic area network.
WLAN	Same as LAN but uses wireless connection.
MAN	Network the size of a few blocks to a metropolitan area.
WAN	Group of LANs that are geographically isolated but are connected to form a large internetwork.
WMN	Mesh network that uses wireless connection only.
WWAN	Similar to WLAN but uses different technology to connect to the internet. Also known as 3G or 4G networks.
Internetwork	A network with geographically disperse connections that connect multiple LANs.
Internet	Large, world-wide, public network.
Intranet	Private network that uses internet technologies.
Extranet	Private network that uses internet technologies but its resources are made available to trusted external users.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	2.7 Compare and contrast Internet connection types, network types, and their features.
	
	• Network types
	  ○ LAN
	  ○ WAN
	  ○ PAN
	  ○ MAN
	  ○ WMN

Video/Demo	Time
6.1.1 Networking	5:24
6.1.2 Network Types	7:47
6.1.3 Networking Terms	11:03
6.1.5 Networking Topologies	7:09
Total Video Time	**31:23**

Fact Sheets

- 6.1.4 Networking Facts
- 6.1.6 Topology Facts

Number of Exam Questions

10 questions

Total Time

About 52 minutes

6.2: Network Hardware

Lecture Focus Questions:

- What is the transmission medium for wireless networks?
- What is the difference between half-duplex mode and full-duplex mode?
- What are the main differences between a hub and a switch? What makes a switch a better choice?
- Which device would you use to connect two network segments with different subnet addresses?
- Which device connects hosts using different transmission media on the same subnet?
- Which type of server handles user authentications?
- What is the role of a DHCP server?
- What are the benefits of using internet appliances?

In this section, you will learn to:

- Select and install a network adapter

Key terms for this section include the following:

Term	Definition
Medium	Hardware or software that provides a path for signals to pass between devices.
Network adapter (NIC)	A hardware device that creates and receives transmission signals sent along the networking medium.
Hub	Central connecting point for multiple media segments on the same subnet.
Switch	Central connection for multiple media segments on the same subnet.
Router	A hardware device that connects two network segments with different subnet addresses.
Bridge	Connects two segments within the same subnet.
Server	A host that provides a service.
VoIP	Software that provides voice communication over an IP network.
Internet appliance	A specialized device that performs a specific network role.
NAS	A device optimized for the single purpose of providing file sharing.
Transceiver	A hardware device that converts digital data into digital signals sent on the medium.
Modem	A hardware device that converts binary data to analog waves and vice versa.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

TestOut PC Pro	1.5 Configure networking devices 1.5.1 Install and configure a wired and wireless network adapters and cables

CompTIA 220-1001	2.2 Compare and contrast common networking hardware devices.
	• Routers
	• Switches
	  ○ Managed
	  ○ Unmanaged
	• Access points
	• Firewall
	• Repeater
	• Hub
	• Bridge
	• Patch panel
	• Ethernet over Power
	• Power over Ethernet (PoE)
	  ○ Injectors
	  ○ Switch
	• Network interface card
	2.5 Summarize the properties and purposes of services provided by networked hosts.
	• Server roles
	  ○ Web server
	  ○ File server
	  ○ Print server
	  ○ DHCP server
	  ○ DNS server
	3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.
	• Expansion cards
	  ○ Network interface card

CompTIA 220-1002	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.
	• Network card properties
	  ○ Half duplex/full duplex/auto
	  ○ Speed

- Wake-on-LAN
- QoS
- BIOS (on-board NIC)

Video/Demo	Time
6.2.1 Network Infrastructure	8:32
6.2.2 Network Devices	7:35
6.2.3 Device Access	4:13
Total Video Time	**20:20**

Lab/Activity

- 6.2.6 Select and Install a Network Adapter

Fact Sheets

- 6.2.4 Network Infrastructure and Device Facts
- 6.2.5 Network Adapter Facts

Number of Exam Questions

14 questions

Total Time

About 57 minutes

6.3: Networking Media

Lecture Focus Questions:

- What are the advantages and disadvantages of coaxial cable?
- Why are wires twisted together in twisted pair cables?
- What is the difference between STP and UTP cabling?
- What is the difference between Cat5 and Cat5e cabling?
- Which connector type and cable grade is used to connect a cable modem to the internet connection?
- What advantages do fiber optic cables offer over twisted pair or other media choices? What are the disadvantages of implementing fiber optic cables?
- What is the difference between single-mode cables and multi-mode cables?
- How can you tell the difference between an ST connector and an SC connector?

In this section, you will learn to:

- Select and install a network adapter

Key terms for this section include the following:

Term	Definition
Coaxial cable	Carries broadband internet signals.
Inner conductor	Carries data signals in cables.
Insulator	Surrounds inner cable conductor and keeps signal separated from the mesh conductor.
Braided mesh conductor	Functions as a second physical channel and as a ground.
Sheath	Encases a cable to protect it from external elements.
RG-59	A coaxial cable specification used for CCTV video systems.
RG-6	A coaxial cable specification used for cable TV, satellite TV, and broadband cable internet.
Unshielded twisted pair (UTP) cable	A cable generally used for Ethernet cables and telephone wires.
Shielded twisted pair (STP) cable	A cable that provides more EMI protection, but is more expensive than UTP cable..
Category 5e (cat 5e) cable	A cable that supports gigabit Ethernet.
Category 6 (cat 6) cable	A gigabit Ethernet cable with 10 Gbps speeds limited to cable length less than 55 meteres.
Category 6a (cat 6a) cable	A gigabit Ethernet cable with 10 Gbps speeds limited to cable length less than 100 meteres.
Category 7 (cat 7) cable	Has the strictest specifications for crosstalk and noise of the Cat cables.

RJ-11 connector	A connector with 4 connectors, 2 pairs of wires, and a locking tab; used primarily for telephone wiring.
RJ-45 connector	A connector with 8 connectors, 4 pairs of wires, and a locking tab; used for Ethernet networks.
Patch twisted pair cable	Uses the same wire configuration on each connector end.
Crossover twisted pair cable	Arrange wires in the first connector using T568A standard and the second connector the T568B standard.
Fiber optic cable	Carries broadband internet signals.
Central core	Carries the signal.
Cladding	Maintains the signal in the center of the core.
Protective layer	Prevents the cladding and central core from breaking.
Plastic sheath	Encases everything and protects the cable.
Single mode cable	Transfers data using a single light ray.
Multi-mode	Transfers data using multiple light rays.
MT-RJ connector	Used with both single and multi-mode cabling.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	3.1 Explain basic cable types, features, and their purposes
	
	• Network cables
	  ○ Ethernet
	  ○ Cat 5
	  ○ Cat 5e
	  ○ Cat 6
	  ○ Plenum
	  ○ Shielded twisted pair
	  ○ Unshielded twisted pair
	  ○ Speed and transmission limitations
	  ○ 568A/B
	  ○ Fiber
	  ○ Coaxial
	
	3.2 Identify common connector types
	
	• RJ-11
	• RJ-45
	• RS-232
	• RG-59
	• RG-6

Video/Demo **Time**

6.3.1 Cable Media	11:38
Total Video Time	**11:38**

Fact Sheets

- 6.3.2 Coaxial Cable Facts
- 6.3.3 Twisted Pair Facts
- 6.3.4 Twisted Pair Connector Facts
- 6.3.5 Fiber Optic Facts

Number of Exam Questions

15 questions

Total Time

About 47 minutes

6.4: Ethernet

Lecture Focus Questions:

- What cable types can be used on an Ethernet network?
- What is the most common cable type and connector?
- What is the difference between a hub and a switch? Why should you choose a switch over a hub?
- When would you use a router on an Ethernet network?
- What cable type and speed are supported on a 1000BaseT network?
- What is the maximum cable length for a 100BaseTX network?

Key terms for this section include the following:

Term	Definition
Network Interface Card (NIC)	This card creates the signals sent along the networking medium.
Networking media	Ethernet supports such cable types as UTP, fiber optic, thinnet, and thicknet.
Connectivity devices	Ethernet uses such connectivity devices as hub, switch, router, bridge, patch panel, and PoE.
Ethernet standards	The standards that identify Ethernet transmission speeds and cable types.
Power over Ethernet (PoE)	PoE distributes electrical power and network data on twisted-pair CAT 5 or higher.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	3.1 Explain basic cable types, features, and their purposes
	• Network cables
	  ○ Ethernet
	  ○ Cat 5
	  ○ Cat 5e
	  ○ Cat 6
	  ○ Fiber
	  ○ Coaxial
	  ○ Unshielded twisted pair
	  ○ Speed and transmission limitations

CompTIA 220-1002	2.2 Compare and contrast common networking hardware devices • Routers • Repeater

- Hub
- Bridge
- Patch panel
- Ethernet over Power
- Power over Ethernet (PoE)
  - Switch
- Network interface card

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

- Establish networking connections
  - WWAN (Cellular)

Video/Demo	Time
6.4.1 Ethernet	4:30
Total Video Time	**4:30**

Fact Sheets

- 6.4.2 Ethernet Facts
- 6.4.3 Ethernet Standards

Number of Exam Questions

9 questions

Total Time

About 24 minutes

6.5: IP Networking

Lecture Focus Questions:

- What is the difference between a MAC address and an IP address? Which address can you assign to a computer?
- How does the IP address indicate both the network and the host address? What is used to identify each part of the address?
- What is the address class of IP address 133.66.155.189?
- What is the default subnet mask for the IP address 166.88.1.45? What is the network address? What is the host address?
- What happens to the MAC address when you move a computer to another network?

Key terms for this section include the following:

Term	Definition
MAC address	A unique hexadecimal identifier burned into the ROM of every network interface.
Logical network address	The numerical address that identifies a subnet.
Logical host address	The numerical address that identifies a specific host on the network.
IP address	A 32-bit binary number represented as four octets (can be represented as decimal or binary).
IP address class	The default network address portion of the IP address. The classes are A, B, C, D, and E.
Protocol	A rule that identifies some aspect of how computers communicate on a network.
Transmission Control Protocol (TCP)	A communication standard for establishing and maintaining a network connection in which application programs can exchange data.
User Data Protocol (UDP)	An alternative to TCP designed to establish low-latency and loss-tolerant connections between applications on the internet.
Network Basic Input/Output System Protocol (NetBIOS)	An industry standard network communication protocol originally developed by IBM.
Encapsulation/tunneling	A process in which non-IP packets are re-packaged as IP packets at the sending device.
Hypertext Transfer Protocol (HTTP)	A protocol used by web browsers and servers to exchange files the the World Wide Web and intranets. This protocol uses port 80.
Hypertext Transfer Protocol Secure (HTTPS)	A secure form of HTTP that uses SSL as sublayer for security. This protocol uses port 443.

File Transfer Protocol (FTP)	A generic method of transferring files that uses port 21.
Simple Mail Transfer Protocol (SMTP)	A protocol that routes electronic mail through the internet using port 25.
Internet Message Access Protocol (IMAP) protocol	An email retrieval protocol that enables users to access their email from various locations without transferring messages or files back and forth between computers. This protocol uses port 143.
Post Office Protocol 3 (POP3)	A part of the IP protocol suite used to retrieve email from a remote server to a local client over and IP connection. This protocol uses port 110.
Telnet Protocol	This protocol allows an attached computer to act as a dumb terminal, with data processing taking place on the IP host computer. Telnet uses port 23.
Secure Shell Protocol (SSH)	This protocol allows secure interactive control of remote systems and uses port 22.
Secure File Transfer Protocol (SFTP)	This protocol has the same functionality as FTP but uses SSH to secure data transmissions. SFTP uses port 22.
Domain Name System (DNS) Protocol	A system distributed throughout the internetwork to provide address/name resolution using port 53.
Remote Desktop Protocol (RDP)	This protocol allows users to view and use the graphical desktop of a remote computer system. RDP uses port 3389.
Dynamic Host Configuration Protocol (DHCP)	This protocol dynamically assigns IP addressing information to network hosts when they come online. It uses ports 67 and 68.
Lightweight Directory Access Protocol (LDAP)	This protocol accesses information about network resources stored by a directory service. It uses ports 389 and 636.
Simple Network Management Protocol (SNMP)	This protocol monitors and manages network devices. It uses ports 161 and 162.
Server Message Block (SMB) Protocol	This protocol enables the sharing of folders and printers on the network. It uses port 445.
Service Location Protocol (SLP)	This protocol organizes and locates various network devices and services. It uses port 427.
Apple Filing Protocol (AFP)	This protocol is used by systems running Mac OS X or newer to support file sharing on the network. It uses port 548.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1001	2.1 Compare and contrast TCP and UDP ports, protocols, and their purposes

CompTIA 220-1002	• Ports and protocols
	  ○ 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
	• TCP vs. UDP
	
	4.9 Given a scenario, use remote access technologies
	
	• RDP
	• Telnet
	• SSH
	• Third-party tools
	  ○ File share

Video/Demo	Time
6.5.1 Device Addressing	6:47
6.5.2 IP Addressing	8:07
Total Video Time	**14:54**

Fact Sheets

- 6.5.3 IP Address Facts
- 6.5.4 TCP/IP Protocol Facts

Number of Exam Questions

15 questions

Total Time

About 40 minutes

6.6: IP Configuration

Lecture Focus Questions:

- What service is used to automatically assign TCP/IP configuration information to hosts?
- When assigning IP addresses to hosts, which portions of the configuration must match values used by other hosts in the same subnet?
- A router has two network interfaces, each connected to a different subnet. When configuring the default gateway value on a host, which IP address would you use?
- What capability does the DNS server address provide? What would happen if the computer was not configured to use a DNS server?

In this section, you will learn to:

- Configure TCP/IP settings
- Configure alternate TCP/IP settings

Key terms for this section include the following:

Term	Definition
IP address	A set of numbers that identifies both the logical host and the logical network addresses.
Subnet mask	A portion of an IP address that identifies which portion of the IP address is the network address and which portion is the host address.
Default gateway	An access point on an IP router that identifies the router to which communications for remote networks are sent.
Domain Name System (DNS) server	A server used to resolve host names to IP addresses.
Hostname	The logical name of the local system.
Static addressing	Manually configuring IP addresses for stations.
Dynamic Host Configuration Protocol (DHCP) server	A server that assigns IP address and other configuration to hosts to ensure error-free host configuration.
Automatic Private IP Addressing (APIPA)	Link-local addressing. If DHCP server cannot be reached, the host will assign itself an IP address.
Alternate IP configuration	An alternate static configuration assigned to host in case of DHCP failure.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.4 Configure PC networking

CompTIA 220-1001	2.4.1 Configure client IP addressing, DNS, and DHCP
	
	2.6 Explain common network configuration concepts
	
	• IP addressing
	  ○ Static
	  ○ Dynamic
	  ○ APIPA
	  ○ Link local
	• Subnet mask
	• Gateway
	• IPv4 vs. IPv6
	• DNS

CompTIA 220-1002	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
	  ○ IP addressing
	  ○ Subnet mask
	  ○ DNS
	  ○ Gateway

Video/Demo	Time
6.6.1 IP Configuration	7:14
6.6.2 TCP/IP Configuration Methods	4:22
6.6.3 Configure TCP/IP Properties	11:50
Total Video Time	**23:26**

Lab/Activity

- 6.6.5 Configure TCP/IP Settings
- 6.6.6 Configure Alternate TCP/IP Settings

Fact Sheets

- 6.6.4 IP Configuration Facts

Number of Exam Questions
13 questions

Total Time
About 66 minutes

6.7: IP Version 6

Lecture Focus Questions:

- What is the primary reason for developing IPv6?
- How many hexadecimal numbers are in an IPv6 address?
- What do you add to an IPv6 address when you remove one or more quartets with all 0's?
- What information is included within the IPv6 address *prefix*?
- How many numbers are used for the interface ID?

Key terms for this section include the following:

Term	Definition
IPv6	It was developed because IPv4 addresses have been exhausted. The address is a 128-bit binary number.
Prefix	It's the first 64 bits of the IPv6 address.
Interface ID	It's the last 64 bits of the IPv6 address.

Video/Demo	Time
6.7.1 IP Version 6	5:20
Total Video Time	**5:20**

Fact Sheets

6.7.2 IPv6 Facts

Number of Exam Questions

8 questions

Total Time

About 19 minutes

6.8: Internet Connectivity

Lecture Focus Questions:

- In which situations would a PSTN be the best internet option? Why?
- How does DSL enable you to talk on the phone and connect to the internet at the same time?
- What is the difference between BRI and PRI service levels when dealing with ISDN internet?
- Which internet connectivity options send digital signals over telephone lines?
- What is a disadvantage of cellular internet access?
- What is required for a satellite internet connection?
- What are the different ways a device can connect to a cellular internet connection?

In this section, you will learn to:

- Configure a cable internet connection
- Configure a DSL internet connection
- Configure a dial-up internet connection

Key terms for this section include the following:

Term	Definition
Dial-up	A connection that uses a modem connected to the phone line to connect to the internet.
Digital Subscriber Line (DSL)	Technology that provides broadband digital data transmission over existing telephone lines.
Integrated Services Digital Network (ISDN)	A digital service running over a switched network. The two versions are ISDN BRI and ISAND PRI.
Cable television	A network that uses a cable TV connection to create a wide area connection to the internet.
Cellular network	A network that uses a cellular phone infrastructure for internet access.
Satellite	A network that uses radio signals sent and received from a satellite.
Line of sight	Networks that use antennas pointed at a large antenna on land instead of a satellite require the antenna to have a clear line of sight, or unobstructed path, to the main antenna.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.5 Configure networking devices

	1.5.1 Install and configure a wired and wireless network adapters and cables 1.5.2 Install and configure internet connection devices 2.2 Compare and contrast common networking hardware devices • Cable/DSL modem 2.3 Given a scenario, install and configure a basic wired/wireless SOHO network • Cable/DSL modem configuration 2.7 Compare and contrast Internet connection types, network types, and their features
CompTIA 220-1001	• Internet connection types ○ Cable ○ DSL ○ Dial-up ○ Fiber ○ Satellite ○ ISDN ○ Cellular ○ Tethering ○ Mobile hotspot ○ Line-of-sight wireless Internet service
	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop
CompTIA 220-1002	• Establish networking connections ○ Dial-ups ○ Wired

Video/Demo	**Time**
6.8.1 Internet Services	11:51
6.8.5 Create a Dial-up Internet Connection	4:00
Total Video Time	**15:51**

Lab/Activity

- 6.8.3 Configure a Cable Internet Connection
- 6.8.4 Configure a DSL Internet Connection
- 6.8.6 Configure a Dial-up Internet Connection

Fact Sheets

- 6.8.2 Internet Connection Facts

Number of Exam Questions

14 questions

Total Time

About 71 minutes

6.9: Network Utilities

Lecture Focus Questions:

- What are the similarities and differences between **ping** and **tracert**?
- When would you use **traceroute** instead of **tracert**?
- What information can you get from the **netstat** command?
- Which utilities can be used to perform remote management of servers?
- What is the difference between the **ifconfig** and **iwconfig** commands?
- Why should you use SSH over Telnet?

In this section, you will learn to:

- Explore configuration information
- Use **ifconfig**

Key terms for this section include the following:

Term	Definition
Ipconfig	A Windows command that displays IP configuration information for network adapters.
Ifconfig	A Windows and Linux command that displays the installed network interfaces and the current configuration settings for each interface.
Ping	A command that sends an ICMP echo request/reply packet to a remote host.
Tracert/traceroute	A command similar to **ping** that also shows the path between the two devices. Use **tracert** on Windows and **traceroute** on Linux and Mac OS.
Nslookup	A command that resolves the IP address of the specified hostname.
Netstat	A command that displays IP-related statistics.
Nbtstat	A command that diagnoses issues regarding NetBIOS over TCP/IP.
Telnet	A remote server management network protocol.
Secure Shell (SSH)	A protocol similar to Telnet that also encrypts all communications and is much more secure.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.4 Configure PC networking 2.4.4 Use network utilities 4.3 Troubleshoot networking

CompTIA 220-1002	4.3.2 Use networking utilities to view, test, and troubleshoot network configuration, communication, and connectivity issues 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 ○ iwconfig/ifconfig 2.5 Compare and contrast social engineering, threats, and vulnerabilities • DoS

Video/Demo	Time
6.9.1 Network Utilities	6:17
6.9.2 Use ipconfig and ifconfig	13:09
6.9.7 Use ping and tracert	9:26
6.9.8 Use nslookup	5:14
Total Video Time	**34:06**

Lab/Activity

- 6.9.3 Explore Configuration Information 1
- 6.9.4 Explore Configuration Information 2
- 6.9.5 Explore Configuration Information 3
- 6.9.6 Use ifconfig

Fact Sheets

- 6.9.9 TCP/IP Utilities

Number of Exam Questions

15 questions

Total Time
About 103 minutes

6.10: Network Troubleshooting

Lecture Focus Questions:

- What is the first thing you should try if the link light is not lit? What should you try next?
- What should you try if all of the computers on the network are having the same problem?
- What kind of problem is likely indicated when you can ping a device by the IP address, but not the host name?
- What additional information is shown when you use the **/all** switch with the **ipconfig** command?
- Two hosts report that they are using the same IP address. What should you do?
- A host has an IP address of 169.254.0.2. What caused this?

In this section, you will learn to:

- Fix a network connection

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	4.3 Troubleshoot networking 4.3.1 Troubleshoot a network connection
CompTIA 220-1001	1.5 Given a scenario, connect and configure accessories and ports of other mobile devices • Connection types ○ Wired 2.8 Given a scenario, use appropriate networking tools • Crimper • Cable stripper • Multimeter • Tone generator and probe • Cable tester • Loopback plug • Punchdown tool 5.7 Given a scenario, troubleshoot common wired and wireless network problems

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

CompTIA 220-1002	3.1 Given a scenario, troubleshoot Microsoft Windows OS problems • Limited connectivity • Common solutions ◦ Update network settings

Video/Demo	Time
6.10.1 Network Troubleshooting	12:57
6.10.2 Troubleshoot Network Connectivity	9:39
Total Video Time	**22:36**

Lab/Activity

- 6.10.4 Fix a Network Connection 1
- 6.10.5 Fix a Network Connection 2

Fact Sheets

- 6.10.3 Network Troubleshooting Facts

Number of Exam Questions

13 questions

Total Time

About 65 minutes

7.1: 802.11 Wireless

Lecture Focus Questions:

- What type of device is required to create an infrastructure wireless network configuration?
- What is the purpose of an SSID?
- Which wireless standards are typically backwards compatible with 802.11g?
- Two access points are part of the same wireless network. Should they use the same channel, or a different channel? Why?
- How does MIMO differ from channel bonding?
- What happens to the speed of a wireless connection as you move away from the access point?
- Which authentication and security method should be used on a wireless network?
- Why should default security settings be changed when dealing with wireless networking?

In this section, you will learn to:

- Connect to a wireless network
- Create a home wireless network
- Secure home wireless network
- Configure a wireless profile

Key terms for this section include the following:

Term	Definition
Ad hoc	A temporary peer-to-peer mode network.
Infrastructure wireless network	An infrastructure wireless network employs an access point that functions like a hub on an Ethernet network.
Service set identifier (SSID)	The network name.
Multiple-input multiple-output (MIMO)	An enhancement that allows multiple antennas to use the same radio frequency.
Channel bonding	Combining channels into one to increase bandwidth.
Multi-user multiple-input multiple-output (MU-MIMO)	An enhancement to MIMO that allows a set of devices with individual antennas, rather than just one device with an antenna, to communicate with each other.
Dual-band access point	A network device that connects Wi-Fi devices to form a Wi-Fi network.
Open authentication	A token-based authentication standard that requires a MAC address to use.
Shared key authentication	A wireless network access protocol that uses WEP.

802.1x authentication	An authentication standard that uses username/passwords, certificates, or devices such as smart cards to authenticate clients.
Wired Equivalent Privacy (WEP)	An optional component of the 802.11 specifications.
Wi-Fi Protected Access (WPA)	A wireless security based on 802.11i specifications.
Wi-Fi Protected Access II (WPA2)	A wireless security that adheres to 802.11i specifications.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.5 Configure networking devices 1.5.1 Install and configure a wired and wireless network adapters and cables 1.5.2 Install and configure internet connection devices 1.2 Given a scenario, install components within the display of a laptop • Types ○ WiFi antenna connector/placement

CompTIA 220-1001	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.

CompTIA 220-1002	• Server roles
	  ○ Authentication server
	
	3.9 Given a scenario, install and configure common devices.
	
	• Laptop/common mobile devices
	  ○ Wireless settings
	
	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop
	
	• Establish networking connections
	  ○ Wireless
	
	2.2 Explain logical security concepts.
	
	• Certificates
	
	2.3 Compare and contrast wireless security protocols and authentication methods.
	
	• Protocols and encryption
	  ○ WEP
	  ○ WPA
	  ○ WPA2
	  ○ TKIP
	  ○ AES
	• Authentication
	  ○ RADIUS
	  ○ TACACS

Video/Demo	Time
7.1.1 Wireless Networking	6:13
7.1.2 Install a Wireless Network Adapter	2:49
7.1.4 Wireless Security	6:50
7.1.6 Configure a Wireless Connection	4:16
Total Video Time	**20:08**

Lab/Activity

- 7.1.7 Connect to a Wireless Network
- 7.1.8 Create a Home Wireless Network
- 7.1.9 Secure Home Wireless Network

- 7.1.10 Configure a Wireless Profile

Fact Sheets

- 7.1.3 Wireless Networking Facts
- 7.1.5 Wireless Security Facts

Number of Exam Questions

12 questions

Total Time

About 91 minutes

7.2: Infrared, Bluetooth, and NFC

Lecture Focus Questions:

- What are typical infrared devices and applications?
- What advantages does Bluetooth offer that infrared does not?
- Which types of devices typically use Bluetooth wireless?
- How does Bluetooth avoid interference with other Bluetooth devices in the area?
- Of the three Bluetooth device classifications, which transmits the farthest? Which is the most common class used by devices?
- Which types of devices use NFC transmissions?
- How is NFC different from Bluetooth?

Key terms for this section include the following:

Term	Definition
Infrared (IR)	Communication technology that uses invisible light waves.
Bluetooth	Communication technology that uses radio waves in the 2.4 ghz range.
Near-field communication (NFC)	Communication technology that enables communication between two devices in close proximity.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	1.5 Given a scenario, connect and configure accessories and ports of other mobile devices.
	• Connection types
	  ○ Proprietary vendor-specific ports (communication/power)
	  ○ NFC
	  ○ Bluetooth
	  ○ IR
	  ○ Wireless
	
	1.6 Given a scenario, configure basic mobile device network connectivity and application support.
	• Bluetooth
	  ○ Enable Bluetooth
	  ○ Enable pairing
	  ○ Find a device for pairing
	  ○ Enter the appropriate pin code
	  ○ Test connectivity

	2.4 Compare and contrast wireless networking protocols. • Bluetooth • NFC

Video/Demo	Time
7.2.1 Infrared, Bluetooth, and NFC	5:14
7.2.2 Configure Bluetooth Connections	5:25
Total Video Time	**10:39**

Fact Sheets

7.2.3 Infrared, Bluetooth, and NFC Facts

Number of Exam Questions

11 questions

Total Time

About 27 minutes

7.3: SOHO Configuration

Lecture Focus Questions:

- In a SOHO network, which types of devices are typically used to connect the location to the internet?
- What function does enabling NAT on the router provide for a SOHO network?
- What is the difference between a public IP address and a private IP address? What are the private IP address ranges?
- What are the advantages of turning off SSID broadcasting?
- What is the purpose of MAC address filtering?
- Once DHCP is disabled on a wireless access point, what three elements would an attacker have to configure to be able to connect?
- What guidelines should you consider when selecting the location of the access point to ensure the signal strength and network access?

In this section, you will learn to:

- Configure a wireless infrastructure

Key terms for this section include the following:

Term	Definition
Small home/home office network (SOHO)	A small office/home office network.
Network Address Translation (NAT)	A method for remapping one IP address space into another by modifying network address information in packets' IP headers while they are in transit.
Wi-Fi protected setup (WPS)	A network security standard for wireless home networks/
Home network	A profile designed for networks in which you know and trust every device.
Work network	A profile designed to be used in a SOHO.
Public Network	A profile designed for use on unknown networks.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.4 Configure PC networking 2.4.3 Configure wired and wireless networking for a SOHO
CompTIA 220-1001	1.5 Given a scenario, connect and configure accessories and ports of other mobile devices. • Connection types

	○ Wired 2.3 Given a scenario, install and configure a basic wired/wireless SOHO network. • Access point settings • NIC configuration ○ Wired ○ Wireless • End-user device configuration • IP addressing • Firewall settings • DMZ • Port forwarding • NAT • UPnP • Whitelist/blacklist • QoS • Wireless settings • QoS 2.4 Compare and contrast wireless networking protocols. • Channels • 1–11 1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop. • Home vs. Work vs. Public network settings
CompTIA 220-1002	

Video/Demo	**Time**
7.3.1 SOHO Configuration	9:39
7.3.3 Configure a SOHO Router	13:13
7.3.4 Configure a Wireless Access Point	5:34
Total Video Time	**28:26**

Lab/Activity

- 7.3.7 Configure a Wireless Infrastructure

Fact Sheets

- 7.3.2 SOHO Configuration Facts
- 7.3.5 Access Point Configuration Facts
- 7.3.6 Windows Network Profile Facts

Number of Exam Questions

13 questions

Total Time

About 69 minutes

7.4: Internet of Things

Lecture Focus Questions:

- Is your hub compatible with Z-Wave or Zigbee?
- What's the difference between smart switches, bulbs, and plugs? Which one would suit your needs better?
- What is a smart speaker/home assistant? What can it connect to?
- How can IoT help you manage several aspects of your home environment remotely?

In this section, you will learn to:

- Configure smart devices

Key terms for this section include the following:

Term	Definition
IoT	The internet of things.
Digital Assistant	A smart speaker that controls your smart appliances and performs other actions through voice commands.
Zigbee	An IoT standard based protocol.
Z-Wave	IoT standard based protocol. Simpler and less expensive than Zigbee.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.4 Configure PC networking 2.4.3 Configure wired and wireless networking for a SOHO

CompTIA 220-1001	2.3 Given a scenario, install and configure a basic wired/wireless SOHO network
	• IoT device configuration
	  ○ Thermostat
	  ○ Light switches
	  ○ Security cameras
	  ○ Door locks
	  ○ Voice-enabled, smart speaker/digital assistant
	2.4 Compare and contrast wireless networking protocols
	• Zigbee

- Z-Wave

Video/Demo	Time
7.4.1 Internet of Things	10:27
7.4.2 Smart Devices	7:02
Total Video Time	**17:29**

Lab/Activity

- 7.4.4 Configure Smart Devices

Fact Sheets

- 7.4.3 Internet of Things Facts

Number of Exam Questions

5 questions

Total Time

About 40 minutes

7.5: Wireless Network Troubleshooting

Lecture Focus Questions:

- What is the first thing you should try if the link light is not lit? What should you try next?
- What solution should you try if all of the computers on the network are having the same problem?
- What kind of problem is likely indicated when you can ping a device by the IP address, but not the hostname?
- What additional information is shown when you use the **/all** switch with the **ipconfig** command?
- Two hosts report that they are using the same IP address. What should you do?
- A host has an IP address of 169.254.0.2. What caused this?

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	5.7 Given a scenario, troubleshoot common wired and wireless network problems.
	• Common symptoms
	  ○ No connectivity
	  ○ Limited connectivity
	  ○ Intermittent connectivity
	  ○ Slow transfer speeds
	  ○ Low RF signal
	  ○ SSID not found
	
	2.8 Given a scenario, use appropriate networking tools.
	• WiFi analyzer

CompTIA 220-1002	3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.
	• Common symptoms
	  ○ Limited connectivity
	• Common solutions
	  ○ Update network settings

Video/Demo	Time
7.5.1 Wireless Network Troubleshooting	9:30
Total Video Time	**9:30**

Fact Sheets

- 7.5.2 Wireless Network Troubleshooting Tool Facts

Number of Exam Questions

6 questions

Total Time

About 21 minutes

8.1: Printers

Lecture Focus Questions:

- Which printer type is ideal for printing carbon-copy documents?
- What is a common application for a thermal printer?
- Why does a laser printer use heat in the printing process?
- What are the two most common printer types?
- In the laser printing process, how does the primary corona prepare the photosensitive drum for writing?

In this section, you will learn to:

- Choose a printer to fulfill the requirements for a given situation

Key terms for this section include the following:

Term	Definition
Dot matrix	An impact printer.
Characters per second (CPS)	A unit of measurement that describes the printing speed of a dot matrix printer.
Inkjet	A non-impact printer that stores ink in a reserve.
Dots per inch (DPI)	A unit of measurement that describes the crispness of inkjet printer's image.
Dye sublimation	The process of turning a water-based dye ink into a gas that bonds with polymers.
Solid ink	A printer that melts ink onto a print head.
Thermal printer	A non-impact printer that uses heat to cause a reaction on specially treated paper.
Cyan, magenta, yellow, and black (CMYK)	The color system used by thermal printers.
Laser printer	A printer that uses a laser and electrical charges to transfer images to paper.
3D printer	A printer that creates a physical object from a digital model.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1001	3.11 Given a scenario, install and maintain various print technologies. • Laser ○ Imaging drum, fuser assembly, transfer belt, transfer roller, pickup

rollers, separate pads, duplexing assembly
    - Imaging process: processing, charging, exposing, developing, transferring, fusing, and cleaning
- Inkjet
    - Ink cartridge, print head, roller, feeder, duplexing assembly, carriage, and belt
    - Calibrate
- Thermal
    - Feed assembly, heating element
    - Special thermal paper
- Impact
    - Print head, ribbon, tractor feed
    - Impact paper
- 3D printers
    - Plastic filament

Video/Demo	Time
8.1.1 Printer Types	10:24
8.1.3 Laser Printing Process	7:45
Total Video Time	**18:09**

Lab/Activity

- 8.1.7 Choose a Printer

Fact Sheets

- 8.1.2 Printer Type Facts
- 8.1.4 Laser Printing Facts
- 8.1.5 Printer Connection Facts
- 8.1.6 Printer Characteristics Facts

Number of Exam Questions

15 questions

Total Time

About 66 minutes

8.2: Printer Configuration

Lecture Focus Questions:

- What is the function of the print driver? Of the print queue?
- Which printing component takes the print job from the queue and sends it to the print device?
- What are three printer languages that printers commonly understand?
- Which virtual printing option allows you to create an XPS file?
- Which printing option allows you to convert a Word document into a JPG file?

In this section, you will learn to:

- Select and install a printer

Key terms for this section include the following:

Term	Definition
Print device	A physical device where print output occurs.
Print driver	A software that communicates with the print device.
Printer	A virtual device that sends output to the printing device.
Print queue	The place where print jobs are stored before going to the print device.
Printer port	The connector where you connect the print device to the print server.
DDI	A device driver interface.
Escape codes	A language used with matrix printers.
PCL	A printer command language.
PostScript	An Adobe printer language.
PDF	The successor to PostScript.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.4 Install and configure a printer 1.4.1 Select and install a printer 3.6 Explain the purposes and uses of various peripheral types. • Printer
CompTIA 220-1001	3.10 Given a scenario, configure SOHO multifunction devices/printers and settings. • Use appropriate drivers for a given operating system ○ Configuration settings

CompTIA 220-1002	○ Duplex ○ Collate ○ Orientation ○ Quality 3.11 Given a scenario, install and maintain various print technologies. • Virtual ○ Print to file ○ Print to PDF ○ Print to XPS ○ Print to image 1.6 Given a scenario, use Microsoft Windows Control Panel utilities. • Devices and Printers

Video/Demo	Time
8.2.1 Printing Configuration	8:40
8.2.2 Install a Local Printer	6:17
8.2.3 Configure Virtual Printing	3:34
Total Video Time	**18:31**

Lab/Activity

8.2.5 Select and Install a Printer

Fact Sheets

8.2.4 Printer Configuration Facts

Number of Exam Questions

6 questions

Total Time

About 42 minutes

8.3: Network Printing

Lecture Focus Questions:

- What is the benefit of network printing?
- When sharing a printer, why might you need to load additional printer drivers?
- Which type of device can act as a print server?
- What is an advantage of having a printer with a built-in print server and network interface?
- When would you use a TCP/IP port when configuring a printer object?
- Which services allow you to print wirelessly to a remote printer?

In this section, you will learn to:

- Configure network printing

Key terms for this section include the following:

Term	Definition
Spooling	A client application generates a print job on the local system.
Queue	A location for storing waiting print jobs.
Print server	The server that manages the flow of documents from the queue to the printer.
Internal print server	A server inside the printer itself.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.4 Install and configure a printer 1.4.3 Configure network printing 3.10 Given a scenario, configure SOHO multifunction devices/printers and settings.

CompTIA 220-1001	• Device sharing
	  ○ Wired
	  ○ USB
	  ○ Serial
	  ○ Ethernet
	  ○ Wireless
	  ○ Bluetooth
	  ○ 802.11(a, b, g, n, ac)
	  ○ Infrastructure vs. ad hoc
	• Device sharing
	  ○ Cloud printing/remote printing
	  ○ Integrated print server (hardware)

CompTIA 220-1002	• Public/shared devices
	  ○ Sharing local/networked device via operating system settings
	  ○ TCP/Bonjour/AirPrint
	  ○ Data privacy
	  ○ User authentication on the device
	  ○ Hard drive caching
	
	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.
	
	• Printer sharing vs. network printer mapping

Video/Demo	Time
8.3.1 Network Printing	9:41
8.3.2 Share a Printer	6:24
8.3.3 Configure a Wireless Network Printer	3:54
Total Video Time	**19:59**

Lab/Activity

- 8.3.5 Configure Network Printing

Fact Sheets

- 8.3.4 Network Printing Facts

Number of Exam Questions

5 questions

Total Time

About 42 minutes

8.4: Printing Management

Lecture Focus Questions:

- Which two objects would you edit to add additional client drivers for printers? Which objects allow you to change the port used by a printer?
- What printing permissions are required to pause the printer or delete all print jobs from the print queue?
- A user prints a document, and it is waiting in the print queue to be printed. Who can delete the print job?

In this section, you will learn to:

- Add a printer
- Manage printing

Key terms for this section include the following:

Term	Definition
Print spooling service	A software process that captures print jobs and sends them to the print device.
Print queue	A location for storing waiting print jobs.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.4 Install and configure a printer 1.4.2 Configure printer properties 1.4.4 Manage printing

CompTIA 220-1001	3.10 Given a scenario, configure SOHO multifunction devices/printers and settings.
	• Use appropriate drivers for a given operating system
	  ○ Configuration settings
	  ○ Duplex
	  ○ Collate
	  ○ Orientation
	  ○ Quality

CompTIA 220-1002	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

Video/Demo	Time
8.4.1 How to Configure Printer Properties	11:18
8.4.2 Manage Print Jobs	5:21
Total Video Time	**16:39**

Lab/Activity

- 8.4.4 Add a Printer
- 8.4.5 Manage Printing

Fact Sheets

- 8.4.3 Printing Management Facts

Number of Exam Questions

5 questions

Total Time

About 51 minutes

8.5: Printer Maintenance

Lecture Focus Questions:

- How do you clean an inkjet printer head?
- What is the best way to clean up a toner spill?
- If you hear a grinding noise as the printer attempts to move the carriage, what should you do?
- At what page count should printer components be replaced?

In this section, you will learn to:

- Maintain a laser printer

Key terms for this section include the following:

Term	Definition
Maintenance kit	A hardware kit that contains replacements for the most-used components components.
Toner	A powdered mixture of plastic particles, carbon, and coloring agents that creates images on paper.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	3.11 Given a scenario, install and maintain various print technologies.
	• Laser
	  ○ Maintenance: Replace toner, apply maintenance kit, calibrate, clean
	• Inkjet
	  ○ Maintenance: Clean heads, replace cartridges, calibrate, clear jams
	• Thermal
	  ○ Maintenance: Replace paper, clean heating element, remove debris
	• Impact
	  ○ Maintenance: Replace ribbon, replace print head, replace paper

Video/Demo	Time
8.5.1 Maintain Laser Printers	10:30
Total Video Time	**10:30**

Fact Sheets

8.5.2 Printer Preventative Maintenance

Number of Exam Questions
7 questions

Total Time
About 23 minutes

8.6: Printer Troubleshooting

Lecture Focus Questions:

- What are three obvious things you should check before doing more extensive printing troubleshooting?
- What problems are indicated if the printer can print a test page, but you cannot send a print job to the printer from a workstation?
- What problems are indicated if a print job is full of garbled text?
- How does paper quality affect a printer?
- What is typically the problem when a vertical stripe is printed down a page?

In this section, you will learn to:

- Troubleshoot and resolve common printing problems

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	4.1 Troubleshoot hardware components 4.1.8 Troubleshoot printer issues 5.6 Given a scenario, troubleshoot printers.
CompTIA 220-1001	• Common symptoms ○ 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 ○ No image on printer display

CompTIA 220-1002	3.1 Given a scenario, troubleshoot Microsoft Windows OS problems. • Common symptoms ○ Printing issues

Video/Demo	Time
8.6.1 Printer Troubleshooting	9:49
8.6.2 Troubleshoot Printing	11:20
Total Video Time	**21:09**

Fact Sheets

8.6.3 Printer Troubleshooting Facts

Number of Exam Questions

15 questions

Total Time

About 42 minutes

9.1: Laptops

Lecture Focus Questions:

- Why don't processors for laptop computers require the large heat sink and fan combinations that PCs use to dissipate heat?
- What types of devices do notebooks use instead of a mouse?
- What is the function of the docking station?
- What kinds of components are typically built into a notebook computer?
- How do you add devices to a notebook computer?

In this section, you will learn to:

- Identify notebook external ports and functions

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	1.3 Given a scenario, use appropriate laptop features.
	• Special function keys
	  ○ 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
	• Port replicator
	• Physical laptop lock and cable lock
	• Rotating/removable screens
	
	3.4 Given a scenario, select, install and configure storage devices.
	• Magnetic hard drives
	  ○ Sizes:
	  ▪ 2.5
	  ▪ 3.5

Video/Demo	Time
9.1.1 Laptops	5:15
9.1.2 External Laptop Ports and Functions	5:36
Total Video Time	**10:51**

Fact Sheets

- 9.1.3 Laptop Facts
- 9.1.4 Laptop Special Keys Facts

Number of Exam Questions

14 questions

Total Time

About 35 minutes

9.2: Laptop Components

Lecture Focus Questions:

- How do you identify the location of components and replacement procedures for notebook systems?
- How can you tell if a failed notebook display is caused by the screen or the video card?
- How can you continue to use a notebook if a built-in component (such as a keyboard, pointing device, or network card) fails?
- When purchasing a replacement internal drive for a notebook, which specifications should you verify before the purchase?
- What type of notebook internal components may require you to remove the keyboard before replacing that component?
- How do you fix common problems with a notebook touchpad?

In this section, you will learn to:

- Replace a hard disk in a notebook computer
- Add memory to a notebook
- Change notebook components such as the keyboard, video card, and other internal components

Key terms for this section include the following:

Term	Definition
Backlight	The light that illuminates an LCD screen so that images on the screen are visible.
Bezel	The plastic casing around an electronic device's screen.
Inverter	A power supply that converts DC power from a computer to AC power for a screen.
Liquid crystal display (LCD)	An electronic display system that switches pixels on and off using liquid crystals that rotate polarized light.
Light-emitting diode	A semiconductor device that emits light when an electric current passes through it.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.6 Manage mobile devices 1.6.1 Install basic hardware components on laptop computers
CompTIA 220-1001	1.1 Given a scenario, install and configure laptop hardware and components. • Hardware/device replacement

    - Keyboard
    - Hard drive
        - SSD vs. hybrid vs. magnetic disk
        - 1.8 in 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
        - 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.

- Disassembling processes for proper reassembly
  - Document and label cable and screw locations
  - Organize parts
  - Refer to manufacturer resources
  - Use appropriate hand tools

Video/Demo	Time
9.2.1 Change a Laptop Hard Drive	2:37
9.2.2 Install Laptop Memory	3:24
9.2.3 Install a Laptop Keyboard	3:20
9.2.4 Replace LCD Components	7:15
9.2.5 Replace Internal Laptop Components	13:45
Total Video Time	**30:21**

Fact Sheets

9.2.6 Laptop Upgrade and Repair Facts

Number of Exam Questions

15 questions

Total Time

About 51 minutes

9.3: Laptop Power Management

Lecture Focus Questions:

- What are the names of the Windows power states?
- What is the purpose of each power state?

In this section, you will learn to:

- Edit power options
- Create a power plan

Key terms for this section include the following:

Term	Definition
Hibernate	A system power state where the system appears to be off and power consumption is reduced to a lower level.
Sleep	A system power state where they system appears to be off, but volatile memory is refreshed and some components remain powered so the computer can wake up quickly if it receives input from a keyboard, LAN, or USB device.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.2 Use operating system features and utilities 2.2.5 Configure power options and settings 1.6 Given a scenario, use Microsoft Windows Control Panel utilities.

CompTIA 220-1002	• Power Options
	  ○ Hibernate
	  ○ Power plans
	  ○ Sleep/suspend
	  ○ Standby

Video/Demo	Time
9.3.1 Portable Power	4:33
9.3.3 Configure Power Options	6:56
Total Video Time	**11:29**

Lab/Activity

- 9.3.5 Edit Power Options
- 9.3.6 Create a Power Plan

Fact Sheets

- 9.3.2 Laptop Power Facts
- 9.3.4 Power Management Facts

Number of Exam Questions

7 questions

Total Time

About 53 minutes

9.4: Laptop Troubleshooting

Lecture Focus Questions:

- You need to replace the RAM in a laptop system. You can't find the memory slots in the system. What should you do?
- You need to clean the LCD display screen on a laptop system. What should you do?
- A laptop displays a warning message that states that the processor temperature is dangerously high. What should you do?
- A laptop's display is blank. What could cause this?
- While running on batteries, the power level of your laptop battery drops quickly. What can you do?
- The keyboard on a laptop doesn't appear to be working. How can you test it?
- A user complains that her laptop has lost connection to your organization's wireless network and can't reconnect. What could be wrong?
- How do you fix common problems with a laptop touchpad?

In this section, you will learn to:

- Locate service manuals for notebook systems
- Perform preventative maintenance on notebook systems
- Troubleshoot power issues on notebook systems
- Troubleshoot video issues
- Troubleshoot malfunctioning notebook components

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.2 Use operating system features and utilities 2.2.5 Configure power options and settings 1.2 Given a scenario, install components within the display of a laptop. • Digitizer/touchscreen

CompTIA 220-1001	5.5 Given a scenario, troubleshoot common mobile device issues while adhering to the appropriate procedures.
	• Common symptoms
	  ○ 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

Video/Demo	Time
9.4.1 Common Laptop Issues	11:15
Total Video Time	**11:15**

Fact Sheets

- 9.4.2 Laptop Maintenance Facts
- 9.4.3 Battery Recalibration Facts
- 9.4.4 Laptop Troubleshooting Facts

Number of Exam Questions

15 questions

Total Time

About 42 minutes

9.5: Mobile Devices

Lecture Focus Questions:

- What is the difference between a laptop computer and mobile device?
- What operating systems run on mobile devices?
- What features are commonly included in mobile devices?
- In what ways do Android, iOS, Windows Lumia, and Google Fuschia differ?

In this section, you will learn to:

- Edit power options
- Create a power plan

Key terms for this section include the following:

Term	Definition
Accelerometer	Detects the physical movements of the tablet by measuring its linear acceleration in one dimension.
Global Positioning System (GPS)	A space-based navigation system that provides location and time information in all weather conditions anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.
Gyroscope	A feature that measures the vertical and horizontal orientation of the device.
International Mobile Equipment Identity (IMEI)	A unique number given to every single mobile phone. The number is typically found behind the battery.
International Mobile Subscriber Identity (IMSI)	A unique identifier that defines a subscriber in the wireless world, including the country and mobile network to which the subscriber belongs. The IMSI is one of the pieces of information stored on a SIM card.
Software development kit (SDK)	A set of software development tools that allows the creation of applications for a certain software package, software framework, hardware platform, computer system, video game console, operating system, or similar development platform.
Android Package (APK)	The package file format used by the Android operating system for the distribution and installation of mobile apps and middleware.
Primary Rate Interface (PRI)	A telecommunications interface standard used on an Integrated Services Digital Network (ISDN) to carry multiple DS0 voice and data transmissions between the network and a user.
Preferred Roming List (PRL)	A database residing in a wireless device that contains information used during the system selection and acquisition process.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

TestOut PC Pro	2.2 Use operating system features and utilities
	2.2.2 Use core macOS or iOS features
	
	1.2 Given a scenario, install components within the display of a laptop.
	• Webcam
	
	1.4 Compare and contrast characteristics of various types of other mobile devices.
	• Tablets
	• Smartphones
	• Wearable technology devices
	  ○ Smart watches
	  ○ Fitness monitors
	  ○ VR/AR headsets
	• E-readers
	• GPS
	
	1.5 Given a scenario, connect and configure accessories and ports of other mobile devices.

CompTIA 220-1001	• Accessories
	  ○ Headsets
	  ○ Speakers
	  ○ Game pads
	  ○ Extra battery packs/battery chargers
	  ○ Protective covers/waterproofing
	  ○ Credit card readers
	  ○ Memory/MicroSD
	
	3.6 Explain the purposes and uses of various peripheral types.
	• Headset
	• NFC/tap pay device
	
	3.9 Given a scenario, install and configure common devices.
	• Laptop/common mobile devices

CompTIA 220-1002	○ Touchscreen configuration ○ Application installations/configurations 1.1 Compare and contrast common operating system types and their purposes. • Cell phone/tablet operating systems ○ Microsoft Windows ○ Android ○ iOS ○ Chrome OS

Video/Demo	Time
9.5.1 Mobile Device Overview	9:58
Total Video Time	**9:58**

Fact Sheets

- 9.5.2 Mobile Device Facts
- 9.5.3 Mobile Communications Facts
- 9.5.4 Mobile Device Accessory Facts

Number of Exam Questions

7 questions

Total Time

About 32 minutes

9.6: Mobile Device Networking

Lecture Focus Questions:

- How do you install apps on a mobile device?
- How do you connect a mobile device to a network?
- How do you secure a mobile device?
- How do you synchronize data between a mobile device and desktop PC or laptop computer?

In this section, you will learn to:

- Network mobile devices
- Synchronize mobile devices
- Configure email on mobile devices

Key terms for this section include the following:

Term	Definition
Bluetooth	Bluetooth is a wireless technology standard for exchanging data over short distances from fixed and mobile devices and for building personal area networks (PANs).
Hotspot	A hotspot is a physical location where you can obtain wireless Internet access using a wireless local area network (WLAN) with a router connected to an internet service provider.
Infrared port (IR)	A port on a mobile device that enables devices to exchange data without using cables.
Lightning	A proprietary computer bus and power connector created by Apple Inc. to replace its previous proprietary 30-pin dock connector.
Long-Term Evolution (LTE)	A mobile communications standard used by 5G.
Mobile Virtual Private Network (Mobile VPN)	A mobile virtual private network (mobile VPN) provides mobile devices with access to network resources and software applications on their home network when they connect using other wireless or wired networks.
Near Field Communication Connector	An NFC connector used to emulate cryptographic smart card functionalities for RFID tags or memory cards.
Tethering	Connecting one device to another.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.6 Manage mobile devices

CompTIA 220-1001	1.6.2 Configure mobile device connectivity
	1.6.3 Use common mobile device features
	2.2 Use operating system features and utilities
	2.2.2 Use core macOS or iOS features
	1.5 Given a scenario, connect and configure accessories and ports of other mobile devices.
	• Connection types
	  ○ Wired
	  ▪ Micro-USB/Mini-USB/USB-C
	  ▪ Lightning
	  ▪ Tethering
	  ▪ Proprietary vendor-specific ports (communication/power)
	  ○ Wireless
	  ▪ NFC
	  ▪ Bluetooth
	  ▪ IR
	  ▪ Hotspot
	1.6 Given a scenario, configure basic mobile device network connectivity and application support.
	• Corporate and ISP email configuration
	  ○ POP3
	  ○ IMAP
	  ○ Port and SSL settings
	  ○ S/MIME
	• VPN
	1.7 Given a scenario, use methods to perform mobile device synchronization.
	• Synchronization methods
	  ○ Synchronize to the cloud
	  ○ Synchronize to the desktop
	  ○ Synchronize to the automobile
	• Types of data to synchronize
	  ○ 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
- Wireless settings

Video/Demo	Time
9.6.1 Networking Mobile Devices	5:09
9.6.3 Synchronize Mobile Devices	5:14
9.6.5 Configure Email on Mobile Devices	2:44
Total Video Time	**13:07**

Lab/Activity

- 9.6.7 Manage Mobile Devices

Fact Sheets

- 9.6.2 Mobile Device Connection Facts
- 9.6.4 Data Synchronization Facts
- 9.6.6 Mobile Email Configuration Facts

Number of Exam Questions

11 questions

Total Time

About 52 minutes

9.7: Mobile Device Security

Lecture Focus Questions:

- What is biometric authentication?
- What is multifactor authentication?
- What is the set number of failed login attempts allowed on a mobile device?
- If you lose your mobile device, how can you find it?
- Which type of device encryption does not encrypt deleted files?

In this section, you will learn to:

- Secure mobile devices

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.2 Implement mobile device security 3.2.1 Implement access control and authentication 3.2.2 Implement device encryption 3.2.3 Implement device location 2.2 Explain logical security concepts. • MDM policies 2.8 Given a scenario, implement methods for securing mobile devices.

CompTIA 220-1002	• Screen locks
	  ○ Fingerprint lock
	  ○ Face lock
	  ○ Swipe lock
	  ○ 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
  - BYOD vs. corporate-owned
  - Profile security requirements

3.5 Given a scenario, troubleshoot mobile OS and application security issues.

- Common symptoms
  - Signal drop/weak signal
  - Power drain
  - Unintended Wi-Fi connection
  - Unintended Bluetooth pairing
  - Leaked personal files/data
  - Unauthorized account access
  - Unauthorized location tracking
  - Unauthorized camera/microphone activation
  - High resource utilization

4.3 Given a scenario, implement basic disaster prevention and recovery methods.

- Cloud storage vs. local storage backups

Video/Demo	Time
9.7.1 Mobile Device Security	7:08
9.7.3 Secure Mobile Devices	5:43
Total Video Time	**12:51**

Lab/Activity

9.7.4 Configure iPad Access Control and Authentication

Fact Sheets

9.7.2 Mobile Device Security Facts

Number of Exam Questions

15 questions

Total Time

About 45 minutes

9.8: Mobile Device Troubleshooting

Lecture Focus Questions:

- What are some of the tools you can use to troubleshoot mobile devices?
- What are some common causes of touchscreen issues?
- What should you do if a mobile device's battery is swollen?
- What can cause a mobile device to perform poorly?
- What is the difference between a cell tower analyzer and a Wi-Fi analyzer?

In this section, you will learn to:

- Troubleshoot problems with mobile devices

Key terms for this section include the following:

Term	Definition
App Scanner	A troubleshooting tool that identifies issues in installed apps.
Wi-Fi Analyzer	A troubleshooting tool for Wi-Fi connectivity issues that identifies the number of broadcasting APs, displays the signal strength and channel of each wireless network, and obtains wireless network information such as the network type, data activity, and service provider.
Cell Tower Analyzer	A troubleshooting tool for cellular network connectivity issues that reports signal strength, interference number of cell towers in the area, the location of each cell tower, and mobile network information such as the network type, data activity, and service provider.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	4.1 Troubleshoot hardware components 4.1.7 Troubleshoot mobile devices 5.5 Given a scenario, troubleshoot common mobile device issues while adhering to the appropriate procedures.
CompTIA 220-1001	• Common symptoms ○ 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
CompTIA 220-1002	3.4 Given a scenario, troubleshoot mobile OS and application issues. • Common symptoms ○ 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

Video/Demo	**Time**
9.8.1 Mobile Device Troubleshooting	7:23
9.8.2 Maintain Mobile Devices	5:51
Total Video Time	**13:14**

Fact Sheets

9.8.3 Mobile Device Troubleshooting Facts

Number of Exam Questions
14 questions

Total Time
About 33 minutes

10.1: Component Selection

Lecture Focus Questions:

- What factors should you evaluate when purchasing or building a new computer system?
- What hardware components may need to be modified to ensure a computer system meets a user's needs?

In this section, you will learn to:

- Analyze users' needs prior to purchasing or building a new computer system
- Customize a computer's hardware to match end user requirements

Key terms for this section include the following:

Term	Definition
Graphics design or CAD/CAM workstation	Require a great deal of processing power.
Audio/video editing workstation	Require extensive video processing and screen space.
Virtualization workstation	Require extensive RAM and CPU processing power.
Gaming system	Require a great deal of processing power.
Home theater system	Implement a high-end audio adapter with a surround-sound speaker system.
Standard thick client	Should be optimized to run desktop productivity applications.
Thin client	Needs to be able to connect to a remote desktop session.
Home or small office server	Typically used for media streaming, file sharing, and printer sharing.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1001	3.8 Given a scenario, select and configure appropriate components for a custom PC configuration to meet customer specifications or needs.
	• Graphic/CAD/CAM design workstation
	  ○ Multicore processor
	  ○ High-end video
	  ○ Maximum RAM
	• Audio/video editing workstation
	  ○ Specialized audio and video card

    - Large, fast hard drive
    - Dual monitors
- Virtualization workstation
    - Maximum RAM and CPU cores
- Gaming PC
    - Multicore processor
    - High-end video/specialized GPU
    - High-definition sound card
    - High-end cooling
- Standard thick client
    - Desktop applications
    - Meets recommended requirements for selected OS
- Thin client
    - Basic applications
    - Meets minimum requirements for selected OS
    - Network connectivity
- Network attached storage device
    - Media streaming
    - File sharing
    - Gigabit NIC
    - RAID array

3.9 Given a scenario, install and configure common devices.

- Desktop
    - Thin client
    - Thick client

Video/Demo	Time
10.1.1 Component Selection	6:46
Total Video Time	**6:46**

Fact Sheets

10.1.2 Component Selection Facts

Number of Exam Questions

10 questions

Total Time

About 22 minutes

10.2: Windows Pre-Installation

Lecture Focus Questions:

- Which edition of Windows would you choose if you needed to connect to a domain and implement BitLocker?
- Which operating system version(s) and edition(s) can run Hyper-V virtual machines?
- Which operating system architectures (32-bit or 64-bit) could you install on a computer with an x64 CPU?
- What are the advantages of using a 64-bit version of the operating system instead of a 32-bit version?
- What are the potential problems when moving from a 32-bit operating system to a 64-bit operating system?
- What is the difference between an upgrade version of Windows and a full version of Windows?
- What is the difference between an in-place upgrade and a clean (custom) installation?
- How would you upgrade a Windows 7 computer to Windows 10?
- What tasks should you perform prior to beginning an operating system upgrade?

In this section, you will learn to:

- Select the correct version and edition of Windows for a given implementation
- Verify system compatibility before upgrading to a newer version of Windows

Key terms for this section include the following:

Term	Definition
Windows 7	Developed to address many of the problems found in Windows Vista.
Windows 8/8.1	Introduced major changes to the Windows OS.
Windows 10	Designed to address many of the issues customers had with Windows 8.
In-Place upgrade	Updates your current Windows installation to a newer version of Windows.
Clean (custom) install	Adds a new installation of Windows.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1001	3.9 Given a scenario, install and configure common devices. • Desktop

CompTIA 220-1002	○ Account setup/settings 1.1 Compare and contrast common operating system types and their purposes. • Workstation operating systems • ○ Microsoft Windows ○ Apple Macintosh OS ○ Linux • Compatibility concerns between operating systems 1.2 Compare and contrast features of Microsoft Windows versions. • Windows 7 • Windows 8 • Windows 8.1 • Windows 10 • Corporate vs. personal needs ○ Domain access ○ Media center ○ BranchCache • Desktop styles/user interface 1.3 Summarize general OS installation considerations and upgrade methods. • 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

4.3 Given a scenario, implement basic disaster prevention and recovery methods.

- Account recovery options

Video/Demo	Time
10.2.1 Windows Versions	5:42
10.2.3 Pre-Installation Planning	9:41
10.2.5 Verify System Compatibility	4:32
Total Video Time	**19:55**

Fact Sheets

- 10.2.2 Windows Versions Facts
- 10.2.4 Installation Planning Facts

Number of Exam Questions

10 questions

Total Time

About 40 minutes

10.3: Windows Installation

Lecture Focus Questions:

- What SATA disk setting would you choose when defining a mirrored set?
- During a Windows installation, your RAID array is not detected. What should you do?
- How can you copy a Windows installation DVD to a flash drive?
- During a Windows installation, you select the destination disk for the installation, but do not configure partition and formatting information. How will Windows partition and format the disk?
- What are the requirements for using disk imaging to clone a Windows system?
- What components are required to set up a network installation server?

In this section, you will learn to:

- Prepare disks for installation
- Install an workstation image using PXE

Key terms for this section include the following:

Term	Definition
Network installation	The Windows installation files must first be copied to a network location.
Unattended	Requires no interaction from the user during the installation process.
Disk imaging	You install Windows on one computer and then copy that image to other computers.
Repair installation	To fix a currently installed Windows implementation.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.1 Install, update, and configure an operating system 2.1.1 Install, update, and configure Windows 2.2 Use operating system features and utilities 2.2.1 Use Windows features and command line utilities 2.4 Configure PC networking 2.4.2 Configure Windows workgroup or domain settings

CompTIA 220-1002	1.3 Summarize general OS installation considerations and upgrade methods.
	• Boot methods
	  ○ USB
	  ○ CD-ROM
	  ○ DVD
	  ○ PXE
	  ○ Solid state/flash drives
	  ○ Netboot
	  ○ External/hot-swappable drive
	  ○ Internal hard drive (partition)
	• Properly formatted boot drive with the correct partitions/format
	
	1.4 Given a scenario, use appropriate Microsoft command line tools.
	• dism
	
	1.7 Summarize application installation and configuration concepts.
	• Methods of installation and deployment
	  ○ Local (CD/USB)
	  ○ Network-based

Video/Demo	Time
10.3.1 Windows Installation	8:34
10.3.2 Prepare Disks for Installation	8:44
10.3.4 Install Windows	7:47
Total Video Time	**25:05**

Lab/Activity

- 10.3.3 Prepare Disks for Installation
- 10.3.5 Install an Workstation Image using PXE

Fact Sheets

- 10.3.6 Installation Facts

Number of Exam Questions

8 questions

Total Time

About 63 minutes

10.4: Post-Installation

Lecture Focus Questions:

- Why should you enable Windows Update immediately after installation?
- How is Windows activated after installation?
- What tools can you use to transfer user accounts, data, and settings from an old Windows system to a new one?
- What should you do to secure a system after installing Windows?
- What should you do to protect system data after installing Windows?

Video/Demo	Time
10.4.1 Post-Installation	6:39
Total Video Time	**6:39**

Fact Sheets

10.4.2 Post-Installation Facts

Number of Exam Questions

5 questions

Total Time

About 17 minutes

10.5: Virtualization

Lecture Focus Questions:

- How does virtualization work?
- What end user needs would require the deployment of a virtualized environment?
- What issues need to be taken into consideration before deploying a virtualized environment?
- What is a hypervisor?
- What is a virtual disk file?
- What is a virtual machine?
- How do you secure a virtual machine after it has been deployed?
- What is the difference between a hybrid cloud and a community cloud?
- What is the difference between IaaS and PaaS?
- What two implementations are available for SaaS?
- What services does cloud computing provide?
- Which cloud computing model allows the client to run software without purchasing servers, data center space, or network equipment?

In this section, you will learn to:

- Enable VT in the BIOS
- Create virtual machines
- Create virtual hard disks

Key terms for this section include the following:

Term	Definition
Hyper-V	Microsoft's enterprise hypervisor.
External virtual network	A virtual network used to provide virtual machines with access to a physical network, allowing them to communicate with externally located servers and clients.
Internal virtual network	A virtual network used to allow communication between virtual machines on the same virtualization host and between virtual machines and the host operating system.
Private virtual network	A virtual network used to allow communication only between virtual machines on the same virtualization server.
Virtualization	The ability to install and run multiple operating systems concurrently on a single physical machine.
Physical machine	The actual system hardware, such as the hard disk drive(s), optical drive, RAM, processors, etc.
Hypervisor	A thin layer of software that resides between the virtual operating system(s) and the hardware.
Virtual machine	A software implementation of a computer that executes programs like a physical machine.

Virtual Hard Disk (VHD)	A file that is created within the host operating system and that simulates a hard disk for the virtual machine.
Full virtualization	A type of virtualization where the virtual machine completely simulates a real physical host.
Partial virtualization	A type of virtualization where only some of the components of the virtual machine are virtualized.
Paravirtualization	A type of virtualization where the hardware is not virtualized.
Cloud computing	A combination of software, data access, computation, and storage services provided to clients through the internet.
Public cloud	Cloud-based computing resources such as platforms, applications, and storage that are made available to the general public by a cloud service provider.
Private cloud	Cloud-based computing resources for a single organization.
Community cloud	Cloud-based computing resources shared by several organizations.
Hybrid cloud	A combination of public, private, and community cloud resources from different service providers.
Infrastructure as a Service (IaaS)	Delivers infrastructure to the client, such as processing, storage, networks, and virtualized environments.
Platform as a Service (PaaS)	Delivers everything a developer needs to build an application.
Software as a Service (SaaS)	Delivers software applications to the client either over the internet or on a local area network.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.7 Configure virtualization 2.7.1 Enable hardware virtualization in BIOS/UEFI 2.7.2 Install and configure a hypervisor 2.7.3 Install and configure a virtual machine 2.7.4 Create and add virtual hard disks
CompTIA 220-1001	2.2 Compare and contrast common networking hardware devices. • Cloud-based network controller 2.6 Explain common network configuration concepts.

- VLAN

4.1 Compare and contrast cloud computing concepts.

- Common cloud models
  - IaaS
  - SaaS
  - PaaS
  - Public vs. private vs. hybrid vs. community
- Shared resources
  - Internal vs. external
- Rapid elasticity
- On-demand
- Resource pooling
- Measured service
- Metered
- Off-site email applications
- Cloud file storage services
  - Synchronization apps
- Virtual application streaming/cloud-based applications
  - Applications for cell phones/tablets
  - Applications for laptops/desktops
- Virtual desktop
  - Virtual NIC

4.2 Given a scenario, set up and configure client-side virtualization.

- Purpose of virtual machines
- Resource requirements
- Emulator requirements
- Security requirements
- Network requirements
- Hypervisor

Video/Demo	Time
10.5.1 Virtualization Overview	14:14
10.5.3 Create a Virtual Machine	8:42
10.5.8 Cloud Computing Overview	13:06
Total Video Time	**36:02**

Lab/Activity

- 10.5.5 Enable VT in the BIOS
- 10.5.6 Create Virtual Machines
- 10.5.7 Create Virtual Hard Disks

Fact Sheets

- 10.5.2 Virtualization Facts
- 10.5.4 Hyper-V Facts
- 10.5.9 Cloud Computing Facts

Number of Exam Questions

15 questions

Total Time

About 103 minutes

11.1: Windows File Locations

Lecture Focus Questions:

- What directory is identified by the %systemroot% variable?
- Which versions of Windows use the default location of C:\Program Files (x86) for the program files?
- Which Windows versions use the C:\Users directory for user profiles?

In this section, you will learn to:

- Find system file locations
- Use libraries

Key terms for this section include the following:

Term	Definition
System file	A critical computer file.
Fonts	A style of typed characters.
Program file	The directory name of a folder.
User files	Contains user preferences.
Temporary file	Files created to temporary contain information.
Library	A grouping of files and folders into a single logical folder.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1002	2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings. • System files and folders 4.8 Identify the basics of scripting. • Environment variables

Video/Demo	Time
11.1.1 System File Locations	8:36
11.1.3 Use Libraries	6:23
Total Video Time	**14:59**

Fact Sheets

- 11.1.2 File Location Facts
- 11.1.4 Library Facts

Number of Exam Questions
7 questions

Total Time
About 32 minutes

11.2: Manage Files on Windows

Lecture Focus Questions:

- When using the command window in Windows, how can you cause the output of a command to list one screen at a time?
- How do you repeat a command by causing the most recent command to appear at the command prompt?
- What function does the **cd ..** command provide?
- Which **dir** command can you use to display only files that are not read-only?
- Which command removes subdirectories and files in the current directory?
- What are the main differences between the **copy** command and the **xcopy** command?
- Which edit command is used to load file(s) in read-only mode?

In this section, you will learn to:

- Manage files and folders

Key terms for this section include the following:

Term	Definition
File extension association	Identifies the program that is used to create a file.
File attribute	Metadata that gives certain qualities to a file after the attribute has been assigned.
Command Prompt	Shortcut on the Start menu for executing commands.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.3 Manage file systems 2.3.1 Manage files and folders

CompTIA 220-1002	1.4 Given a scenario, use appropriate Microsoft command line tools.
	• Navigation
	  ○ dir
	  ○ cd..
	• copy
	• xcopy
	• robocopy
	1.6 Given a scenario, use Microsoft Windows Control Panel utilities.

- Folder Options
  - View hidden files
  - Hide extensions
  - General options
  - View options

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

- NTFS vs. share permissions
  - Allow vs. deny
  - Moving vs. copying folders and files
  - File attributes

4.8 Identify the basics of scripting.

- Script file types
  - .bat
  - .ps1
  - .vbs
  - .sh
  - .py
  - .js
- Comment syntax
- Basic script constructs
  - Basic loops
  - Variables
- Basic data types
  - Integers
  - Strings

Video/Demo	Time
11.2.1 Windows File and Folder Properties	6:23
11.2.4 Manage Files on Windows	13:03
11.2.6 Manage Directories from the Command Prompt	14:00
11.2.7 Manage Files from the Command Prompt	12:01
Total Video Time	**45:27**

Lab/Activity

- 11.2.5 Manage Files
- 11.2.9 Manage Files and Folders

Fact Sheets

- 11.2.2 File Extension Facts
- 11.2.3 Attribute Facts
- 11.2.8 File Management Commands

Number of Exam Questions
15 questions

Total Time
About 100 minutes

11.3: NTFS Permissions

Lecture Focus Questions:

- Which NTFS permissions are required to allow a user to open, edit, and save changes to a document?
- How does file ownership affect access and permissions?
- If you have the Modify permission to a folder, what actions can you complete within that folder?
- What happens when a user belongs to two groups, and a specific permission is allowed for one group and denied for the other?
- What does it mean if permissions are *cumulative*?
- To move a file or folder, which permission must you have to the source file? Which permission must you have to the destination location?

In this section, you will learn to:

- Configure NTFS permissions

Key terms for this section include the following:

Term	Definition
NTFS permissions	With NTFS permissions, each file and folder has an access control list (ACL).
Access Control List (ACL)	Identifies the users or groups and their level of access to the folder or file.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.3 Manage file systems 2.3.2 Configure file access permissions

CompTIA 220-1002	1.7 Summarize application installation and configuration concepts.
	• Local user permissions
	  ○ Folder/file access for installation
	
	2.6 Compare and contrast the differences of basic Microsoft Windows OS security settings.
	• NTFS vs. share permissions
	  ○ Allow vs. deny
	  ○ Moving vs. copying folders and files

- File attributes

Video/Demo	Time
11.3.1 NTFS Permissions	6:04
11.3.2 Configure NTFS Permissions	10:56
Total Video Time	**17:00**

Lab/Activity

- 11.3.4 Configure NTFS Permissions

Fact Sheets

- 11.3.3 NTFS Permission Facts

Number of Exam Questions

11 questions

Total Time

About 45 minutes

11.4: Shared Folders

Lecture Focus Questions:

- How are the simple share permissions different from the advanced share permissions?
- What are the differences between share and NTFS permissions?
- Which permissions (share or NTFS) apply to both local and network access of files? Which permissions can you use on FAT32 volumes?
- How can you control access to a specific file within a shared folder?
- What is the format for the UNC path to a shared folder? How is this different from the drive letter and path?
- Which **net use** command option makes drive mappings permanent?

In this section, you will learn to:

- Share and secure folders

Key terms for this section include the following:

Term	Definition
Shared folder	A set of files that are made available to other users over the network.
Share permissions	Control the level of access that users have when accessing files over the network.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.3 Manage file systems 2.3.3 Share and secure files and folders 2.4 Configure PC networking 2.4.2 Configure Windows workgroup or domain settings 2.4.5 Configure network drive mappings
CompTIA 220-1002	1.3 Summarize general OS installation considerations and upgrade methods. • Workgroup vs. Domain setup 1.4 Given a scenario, use appropriate Microsoft command line tools.

- net use

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

- System utilities
- Regedit
- Command
- Services.msc
- MMC
- MSTSC
- Notepad
- Explorer
- Msinfo32
- DxDiag
- Disk Defragmenter
- System Restore
- Windows Update

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

- Network shares/administrative shares/mapping drives

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

- Shared files and folders
  - Administrative shares vs. local shares
  - Permission propagation
  - Inheritance

4.9 Given a scenario, use remote access technologies.

- Third-party tools
  - File share

Video/Demo	Time
11.4.1 Shared Folders	3:18
11.4.2 Configure Basic Folder Sharing on Windows	7:01
11.4.3 Configure Advanced Folder Sharing on Windows	11:31
11.4.4 Configure Share and NTFS Permissions	4:50
Total Video Time	**26:40**

Lab/Activity

- 11.4.6 Share and Secure Folders

Fact Sheets

- 11.4.5 Shared Folder Facts

Number of Exam Questions

11 questions

Total Time

About 55 minutes

11.5: Linux File Management

Lecture Focus Questions:

- Which Linux command is used to display the current working directory?
- Which Linux command is used to display a listing of all files and subdirectories in the current directory?
- Which Linux command is used to navigate between directories?
- Which Linux commands is used to copy and move data?
- Which Linux commands is used to delete data?
- Which Linux commands is used to view the contents of files?
- Which Linux commands is used to edit a text file?
- Which Linux commands is used to manage file and folder ownership and permissions?
- Which Linux commands is used to power off the system?

In this section, you will learn to:

- Manage the Linux file system
- Manage Linux file ownership

Key terms for this section include the following:

Term	Definition
File system	Determines how a computer's files are organized on a hard drive.
man utility_name	Command at the shell prompt to view the syntax along with all of the options that can be used.
Second Extended File System	One of the oldest Linux file systems.
Third Extended File System	An updated version of ext2 that supports journaling.
Reiser File System	An alternative to the ext3 file system.
ext4	The fourth generation file system in the ext file system family.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.3 Manage file systems 2.3.1 Manage files and folders
CompTIA 220-1002	1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems. • Basic Linux commands • ls

- grep
- cd
- shutdown
- pwd vs. passwd
- mv
- cp
- rm
- chmod
- chown
- vi
- dd

4.8 Identify the basics of scripting.

- Environment variables

Video/Demo	Time
11.5.1 Manage the Linux File System	11:05
11.5.2 View File Contents	7:49
11.5.3 Edit File Contents	10:52
11.5.4 Manage Ownership and Permissions	8:30
Total Video Time	**38:16**

Lab/Activity

- 11.5.6 Manage the Linux File System
- 11.5.7 Manage Linux File Ownership

Fact Sheets

- 11.5.5 Linux File Management Facts

Number of Exam Questions

7 questions

Total Time

About 75 minutes

12.1: Windows System Tools

Lecture Focus Questions:

- What configuration tasks can you perform using Control Panel?
- Which tool lets you view running tasks and current memory use?
- How does Msconfig differ from Msinfo32? When are you more likely to use Msconfig over Msinfo32?
- Which of the following utilities typically shows the same information included in the other two utilities: Msconfig, Msinfo32, or Dxdiag?
- How should you normally modify settings in the registry?
- What commands can be used from the command prompt to shut down the system, manage processes, and establish a Remote Desktop session?

In this section, you will learn to:

- Use Task Manager to view current performance statistics
- Use Control Panel to configure your system
- Use system tools to view configuration information for your computer
- Use prebuilt and custom management consoles to manage your computer
- View and edit registry settings
- Manage files, processes, and system settings from the command prompt

Key terms for this section include the following:

Terms	Definitions
Task Manager	A utility that comes with Microsoft Windows to allow users and administrators to do various tasks and perform system administration.
Process	An instance of a computer program that is being executed.
Services Console	A utility used by Windows to stop, start, and manage background services used by Windows and applications.
Service	A program that processes requests from other applications or users.
Control Panel	A Windows utility program that contains tools called applets that are used to manage hardware, software, users, and the system.
Sync Center	A Windows feature that allows you to keep information in sync between your computer and files stored in folders on network servers.
Microsoft Management Console (MMC)	The Microsoft Management Console (MMC) is a framework that provides a common user interface for performing system administration tasks.
Device Manager	A Windows tool for managing computer hardware.
Disk Management	A utility built into Windows that is used to create, delete, and format partitions.

Windows Firewall	A security application created by Microsoft and built into Windows.
Computer Management	A collection of Windows administrative tools, or snap-ins, that you can use to manage a computer.
Event Viewer	A Windows tool for troubleshooting applications and hardware. It displays logs for hardware failure, OS failure, OS errors, devices or services that fail to start, and other errors.
Microsoft Registry Editor	A tool for modifying entries in the Windows registry.
DxDiag	A tool that shows information related to DirectX operation.
Microsoft Terminal Services Client	A remote management service that allows users to take control of remote computers over a network connection.
Notepad	A simple text editor for Microsoft Windows and a basic text editing program that enables computer users to create documents.
System Restore	A recovery tool for Microsoft Windows that allows you to reverse certain changes made to the operating system.
Windows Update	A Microsoft service for Windows that automates downloading and installing software updates over a network or the internet.
Microsoft Register Server	A command line tool that registers .dll files as command components in the registry.
Open Database Connectivity ODBC	The standard application programming interface for accessing database management systems (DBMS).
Explorer	A file manager application that comes with Microsoft Windows. This function is also known as File Explorer or Windows Explorer.
Disk Defragmenter	A utility in Microsoft Windows designed to increase access speed by rearranging files stored on a disk to occupy contiguous storage locations.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.2 Use operating system features and utilities 2.2.1 Use Windows features and command line utilities
CompTIA 220-1002	1.4 Given a scenario, use appropriate Microsoft command line tools. • taskkill

- shutdown
- [command name] /?
- Commands available with standard privileges vs. administrative privileges
- gpupdate
- gpresult

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
- MSConfig
  - General
  - Boot
  - Services
  - Startup
  - Tools
- 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.

- Sync Center
- Troubleshooting

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
- Restart services
- Disable application startup

4.8 Identify the basics of scripting.

- Environment variables

Video/Demo	Time
12.1.1 Use Task Manager	13:47
12.1.3 Use Control Panel	4:58
12.1.5 Use Management Consoles	7:37
12.1.7 View System Information	6:29
12.1.8 System Configuration and DirectX	5:23
12.1.9 Use Regedit	5:58

12.1.11 Explore System Commands	10:38
Total Video Time	**54:50**

Lab/Activity

- 12.1.13 Use System Commands

Fact Sheets

- 12.1.2 Task Manager Facts
- 12.1.4 Control Panel Facts
- 12.1.6 Management Consoles Facts
- 12.1.10 Windows Utilities Facts
- 12.1.12 System Command Facts

Number of Exam Questions

15 questions

Total Time

About 107 minutes

12.2: Preferences and Settings

Lecture Focus Questions:

- How can you customize the look and feel of the Windows desktop environment?
- How does indexing optimize the process for finding files on Windows?
- What types of changes do Region and Language Settings make on your computer?

In this section, you will learn to:

- Download and install a Windows theme
- Add and remove file locations for indexing
- Configure locales, regional settings, and alternate input languages

Key terms for this section include the following:

Terms	Definitions
Lock screen	The screen you select to slide out of the way so you can get to the sign-in screen where you enter your username and password.
Theme	Used to customize the way the Windows desktop appears.
Taskbar	The area normally located at the bottom of the Windows desktop that displays information about open programs and provides quick access to others.
Screen saver	A computer program that blanks the screen or fills it with moving images or patterns when the computer is not in use.
Indexing	A Windows service that maintains an index of files on a computer or network to improve search performance.

Video/Demo	Time
12.2.1 Personalize Windows	4:24
12.2.2 Configure Region and Language Options	3:25
12.2.3 Index Files	5:16
Total Video Time	**13:05**

Fact Sheets

12.2.4 Preferences Facts

Number of Exam Questions

5 questions

Total Time

About 24 minutes

12.3: Performance Monitoring

Lecture Focus Questions:

- Which system components are commonly monitored to troubleshoot system performance?
- When examining system performance statistics, what is the difference between counters and objects?
- What should be done if the processor utilization in a system is consistently over 90%?
- What should be done if the amount of memory being utilized in a system is close to the amount of RAM installed?
- What should be done if the page file utilization in a system is near 100%?
- What causes thrashing? Which performance statistic might be examined to identify thrashing?
- Which statistics should be examined to diagnose a network adapter bottleneck?

After finishing this section, you should be able to complete the following tasks:

- Monitor system performance using Task Manager
- Monitor system performance using Performance Monitor
- Monitor system performance using Resource Monitor
- Monitor system performance using Reliability Monitor

Key terms for this section include the following:

Terms	Definitions
Bottleneck	Occurs when a component is unable to keep up with demand and subsequently slows down other processes or functions.
Processor utilization	The amount (percentage) of time the processor spends doing non-idle tasks.
Thrashing	Occurs when a computer's virtual memory resources become saturated leading to a constant state of paging.
Page File	The Windows swap file that is used to hold the virtual memory that is used to enhance physical memory installed in a computer.
Network utilization	The amount of traffic sent and received by a network connection.
Counter	A specific statistic you can monitor (such as the amount of free memory or the number of bytes sent on a network card).
Object	A statistic group, often corresponding to a specific type of hardware device or software process (such as the processor or memory).

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	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

Video/Demo	Time
12.3.1 Performance Monitoring	6:22
12.3.2 Monitor System Performance	7:42
Total Video Time	**14:04**

Fact Sheets

12.3.3 Performance Monitoring Facts

Number of Exam Questions

9 questions

Total Time

About 29 minutes

12.4: Active Directory

Lecture Focus Questions:

- What are the benefits of Active Directory?
- What is a domain?
- What is an organizational unit?
- Which service does Active Directory use to locate and name objects?
- If a GPO is applied to an organizational unit, how does it affect objects in the organizational unit?
- Which containers cannot have GPOs linked to them?

In this section, you will learn to:

- Join a domain.
- Manage Active Directory objects.
- Create and delete organizational units.

Key terms for this section include the following:

Terms	Definitions
Active Directory	A centralized database that contains user account and security information.
Organizational Unit (OU)	A container (similar to a folder) that subdivides and organizes other OUs, users, groups, and computers within a domain.
Tree	A group of related domains that share the same contiguous DNS namespace.
Forest	A collection of related domain trees. The forest establishes the relationship between trees that have different DNS name spaces.
Domain	An administratively defined collection of network resources that share a common directory database and security policies.
Objects	Within Active Directory, users, groups, and computers, each resource is identified as an object.
Domain controller	A Windows server that holds a copy of the Active Directory database.
Policy	A set of configuration settings applied to users or computers.
Group Policy Object (GPO)	A collection of policy settings that are stored in Active Directory.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1002	1.4 Given a scenario, use appropriate Microsoft command line tools. • net user

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
  - dvanced Security
  - Event Viewer
  - User Account Management

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

- User Accounts

2.2 Explain logical security concepts.

- Active Directory
  - Group Policy/Updates
  - Domain

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
  - Logon time restrictions
  - Disabling guest account

- Account creation
- Account deletion
- Disable account

Video/Demo	Time
12.4.1 Active Directory Overview	8:24
12.4.2 Join a Domain	8:45
12.4.4 Manage Active Directory Objects	10:24
12.4.9 Group Policy	9:52
12.4.10 Use Group Policy	7:48
Total Video Time	**45:13**

Lab/Activity

- 12.4.3 Join a Workstation to a Domain
- 12.4.6 Create User Accounts
- 12.4.7 Create OUs
- 12.4.8 Delete OUs

Fact Sheets

- 12.4.5 Active Directory Facts
- 12.4.11 Group Policy Facts

Number of Exam Questions

12 questions

Total Time

About 116 minutes

12.5: Users and Groups

Lecture Focus Questions:

- How can groups simplify security administration?
- How are the rights assigned to the Users group different from the rights assigned to the Administrator group?
- What is the purpose of the Backup Operators group?
- Which group must a user must be a member of to install applications and add new device drivers?
- What is the purpose of the User Account Control (UAC)?
- When would you receive a prompt for credentials? How does that differ from the prompt for consent?

In this section, you will learn to:

- Create limited and administrative users
- Create groups and modify group membership
- Supply credentials at the UAC prompt
- Enable or disable UAC prompts

Key terms for this section include the following:

Terms	Definitions
User Account	The user account identifies a specific user.
Logon	The process of authenticating to the computer by supplying a user account name and its associated password.
Rights	The ability to perform actions on a computer, such as modifying system settings or installing hardware.
Permissions	Access to files, folders, and printers is controlled through permissions. Permissions identify what the user can do with the associated object.
Groups	Rights and permissions can be assigned to multiple users through groups.
User Account Control (UAC)	A Windows tool that minimizes the dangers of unwanted actions or unintended software installations.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.1 Install, update, and configure an operating system 2.1.7 Configure local users and groups

CompTIA 220-1002	1.4 Given a scenario, use appropriate Microsoft command line tools.
	• net user
	
	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
	
	1.6 Given a scenario, use Microsoft Windows Control Panel utilities.
	• User Accounts
	
	2.2 Explain logical security concepts.
	• Active Directory
	  ○ Domain
	
	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
  - Logon time restrictions
  - Disabling guest account
  - Account creation
  - Account deletion
  - Disable account

Video/Demo	Time
12.5.1 Users and Groups	6:31
12.5.2 Manage Local Users and Groups	7:55
12.5.4 Authenticate with Online User Accounts	4:07
12.5.7 Manage UAC Settings	6:56
Total Video Time	**25:29**

Lab/Activity

- 12.5.6 Manage Users and Groups

Fact Sheets

- 12.5.3 User and Group Facts
- 12.5.5 Online Authentication Facts
- 12.5.8 UAC Facts

Number of Exam Questions

11 questions

Total Time

About 64 minutes

12.6: Remote Services

Lecture Focus Questions:

- Which editions of Windows supports a guest Remote Desktop connection? A host Remote Desktop connection?
- Which users are allowed to establish a Remote Desktop session?
- Which port must be opened to allow a Remote Desktop session through the firewall?
- How does printer redirection work in Remote Desktop?
- What are the different ways you can send a Remote Assistance invitation?

In this section, you will learn to:

- Configure a host computer to accept Remote Desktop connections
- Specify which users are allowed to establish a Remote Desktop session
- Open the Remote Desktop port in the Windows Firewall
- Establish a guest Remote Desktop connection

Key terms for this section include the following:

Terms	Definitions
Remote Desktop Connection (RDC)	A Windows tool that gives a user access to a Windows desktop from a remote location through a network.
Remote Desktop Protocol (RDP)	A Windows protocol used by Remote Desktop and Remote Assistance utilities to connect to and control a remote computer.
Telnet	A plain-text, unsecured, remote console connection.
Secure Shell (SSH)	A encrypted, secured, remote console connection.
Remote Assistance	A Windows tool that allows a user to remote in to anther user's computer while the user remains signed, retains control of the session, and can see the screen.
Screen Sharing	A utility to remotely view and control a Mac that is similar to Remote Assistance in Windows.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.6 Implement remote access 2.6.1 Configure Remote Desktop Connection

CompTIA 220-1002	1.6 Given a scenario, use Microsoft Windows Control Panel utilities.
	• System
	  ○ Performance (virtual memory)
	  ○ Remote settings
	  ○ System protection
	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.
	• Remote Desktop Connection
	• Remote Assistance
	1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.
	• Tools
	  ○ Screen sharing
	4.9 Given a scenario, use remote access technologies.
	• Security considerations of each access method

Video/Demo	Time
12.6.1 Remote Desktop	5:42
12.6.2 Use Remote Desktop	10:48
12.6.4 Remote Assistance	3:10
12.6.6 Use Remote Assistance	7:08
12.6.8 Use Screen Sharing	5:35
Total Video Time	**32:23**

Lab/Activity

- 12.6.7 Configure Remote Services

Fact Sheets

- 12.6.3 Remote Desktop Facts
- 12.6.5 Remote Assistance Facts
- 12.6.9 Screen Sharing Facts

Number of Exam Questions
10 questions

Total Time
About 70 minutes

12.7: Windows Application Management

Lecture Focus Questions:

- What is the difference between a traditional desktop application and a Metro app from the Windows Store?
- How is a shortcut different from an executable file?
- What is the difference between the Program Files and the Program Files (x86) folders? Which operating systems have the Program Files (x86) folder?
- What group membership is required for a user to install or uninstall applications?
- How can older applications be configured to run on newer versions of Windows?
- Which tool should be used to schedule an application to run automatically in the future?

In this section, you will learn to:

- Install, uninstall, and repair desktop applications
- Install and uninstall apps
- Run an application as an administrator
- Configure compatibility mode for an application
- Schedule a task to run automatically

Key terms for this section include the following:

Terms	Definitions
Application	A software program such as web browsers, word processors, games, and utilities.
Compatibility Mode	A feature that allows you to run an older program using settings from a previous version of Windows.
Program Files	The directory name of a standard folder in Microsoft Windows operating systems in which applications are typically installed.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.2 Use operating system features and utilities 2.2.4 Manage applications and processes 1.5 Given a scenario, use Microsoft operating system features and tools.

CompTIA 220-1002	• 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

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

- Programs and features

Video/Demo	Time
12.7.1 Windows Desktop Applications	4:16
12.7.2 Manage Windows Desktop Applications	10:27
12.7.4 Configure Application Compatibility	6:54
12.7.6 Schedule Tasks	3:56
12.7.7 Windows Store Applications	2:43
12.7.8 Manage Windows Store Apps	5:12
Total Video Time	**33:28**

Lab/Activity

- 12.7.9 Manage Applications
- 12.7.10 Repair Programs

Fact Sheets

- 12.7.3 Desktop Application Management Facts
- 12.7.5 Application Compatibility Facts

Number of Exam Questions

4 questions

Total Time

About 72 minutes

12.8: Linux Application Management

Lecture Focus Questions:

- What is a software package?
- Which Linux distributions use the **yum** command to manage software? Which distributions use **apt-get**?
- Which **yum** command searches online repositories for a particular package, downloads it, and installs it?
- Which **yum** command downloads and installs the latest updates for packages installed on the system?
- Which **apt-get** command uninstalls a package from the system?
- Which **apt-get** command updates all of the installed packages on a system?
- Which option can be used with the **ps** command to view all processes running on the system?
- How can you get help with a Linux command?

In this section, you will learn to:

- Install, uninstall, and update software packages with **yum**
- Install, uninstall, and update software packages with **apt-get**
- Monitor running processes with the **ps** command

Key terms for this section include the following:

Terms	Definitions
Linux	An open source and freely distributed operating system based on UNIX that was created by Linus Torvalds of Finland.
yum	A command that installs packages on Linux systems that use the Red Hat Package Manager (RPM).
apt-get	A command that installs packages on Linux systems that use the Debian Package Manager (dpkg).
ps utility	A command used to display running processes on a Linux system.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.1 Install, update, and configure an operating system 2.1.3 Install, update, and configure Linux 2.2 Use operating system features and utilities 2.2.4 Manage applications and processes

CompTIA 220-1002	1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.
	• Best practices
	  ○ System updates/App Store
	• Tools
	  ○ Force Quit
	• Basic Linux commands
	  ○ ls
	  ○ grep
	  ○ cd
	  ○ shutdown
	  ○ pwd vs. passwd
	  ○ mv
	  ○ cp
	  ○ rm
	  ○ chmod
	  ○ chown
	  ○ iwconfig/ifconfig
	  ○ ps
	  ○ u/sudo
	  ○ apt-get
	  ○ vi
	  ○ dd
	  ○ kill

Video/Demo	Time
12.8.1 Install Linux Software	6:32
12.8.2 Manage Apps on Linux	2:28
12.8.3 Manage Processes on Linux	6:43
Total Video Time	**15:43**

Lab/Activity

12.8.5 Manage Linux Processes

Fact Sheets

12.8.4 Linux Application Management Facts

Number of Exam Questions

6 questions

Total Time

About 39 minutes

12.9: Digital Content Management

Lecture Focus Questions:

- What is the difference between a personal software license and an enterprise (or volume) software license?
- What does the EULA contain?
- How does open source software differ from software protected by a proprietary license agreement?
- How are open source development projects funded?
- How do DRM mechanisms protect media files from illegal copy?

In this section, you will learn to:

- Select the correct software license for a specific implementation
- Explain the benefits and drawbacks of open source software

Key terms for this section include the following:

Terms	Definitions
Digital Rights Management (DRM)	Software and hardware security limitations meant to protect digital content and prevent piracy.
Proprietary	Something used, made, or sold only by the particular person or company.
Open source	Source code for an operating system or other software whereby the source code is available for free and anyone can modify and redistribute the source code.
End User License Agreement (EULA)	A legal contract between a software application author or publisher and the end user of that application detailing the terms of use.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.
	• Licensing/DRM/EULA
	  ○ Open-source vs. commercial license
	  ○ Personal license vs. enterprise licenses

Video/Demo	Time
12.9.1 Software Licensing	8:00

12.9.2 Digital Rights Management (DRM)	8:06
Total Video Time	**16:06**

Fact Sheets

12.9.3 Digital Content Management Facts

Number of Exam Questions

5 questions

Total Time

About 27 minutes

12.10: Updates

Lecture Focus Questions:

- What is the difference between a hotfix and a service pack?
- What are two reasons why updates are released for the operating system?
- How does keeping system software up-to-date increase security?
- Which update setting would be appropriate if you wanted to review updates before they are installed?
- In addition to using Windows Update, what else should you do to make sure that all application and driver files are updated?
- How are updates applied on Linux and macOS operating systems?

In this section, you will learn to:

- Configure Windows Updates
- Update a Linux distribution
- Update a Macintosh system
- Update the firmware on a network device

Key terms for this section include the following:

Terms	Definitions
Hotfix	An operating system patch that fixes bugs and other vulnerabilities in the software.
Service Pack (SP)	A collection of hotfixes and other system enhancements.
Windows Update	A feature of the Windows operating system that helps you keep your computer up to date.
Microsoft Update	Updates for Microsoft applications such as Office applications.
End of life	A term used in reference to a product supplied to customers, indicating that the product is at the end of its useful life and a vendor stops marketing, selling, or maintaining it.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.2 Configure hardware components 1.2.3 Implement firmware updates 2.1 Install, update, and configure an operating system 2.1.2 Install, update, and configure macOS

CompTIA 220-1002	2.1.3 Install, update, and configure Linux
	3.1 Implement tools to detect, remove, and prevent malware
	3.1.4 Configure operating system updates
	1.1 Compare and contrast common operating system types and their purposes.
	• Vendor-specific limitations
	  ○ End-of-life
	  ○ Update limitations
	1.3 Summarize general OS installation considerations and upgrade methods.
	• OS compatibility/upgrade path
	1.5 Given a scenario, use Microsoft operating system features and tools.
	• System utilities
	  ○ Regedit
	  ○ Command
	  ○ Services.msc
	  ○ MMC
	  ○ MSTSC
	  ○ Notepad
	  ○ Explorer
	  ○ Msinfo32
	  ○ DxDiag
	  ○ Disk Defragmenter
	  ○ System Restore
	  ○ Windows Update
	1.7 Summarize application installation and configuration concepts.
	• OS requirements
	  ○ Compatibility
	1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.

- Best practices
  - System updates/App Store
  - Patch management

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

- Patch/update management

Video/Demo	Time
12.10.1 Updates	6:26
12.10.2 Use Windows Update	6:41
12.10.5 Update Linux	4:18
12.10.6 Update macOS	2:48
12.10.7 Perform a Firmware Update	4:03
Total Video Time	**24:16**

Lab/Activity

- 12.10.4 Configure Windows Update
- 12.10.8 Update Firmware

Fact Sheets

- 12.10.3 Update Facts

Number of Exam Questions

8 questions

Total Time

About 62 minutes

12.11: System Backup

Lecture Focus Questions:

- What type of data is backed up with a system image backup?
- Which tools could you use to back up user data on different versions of Windows?
- What types of media can Backup and Restore write to?
- Where should backup media be stored for maximum security?
- Why should you test your restore methods?
- What is the difference between Backup and Restore and File History?

In this section, you will learn to:

- Create a system image backup
- Schedule automatic backups of user data
- Protect user data with File History
- Back up user data on Linux and macOS

Key terms for this section include the following:

Terms	Definitions
Backup	A copy of data that is archived and can be used to restore corrupt or lost data in the event of a hardware or system failure.
System state	Data that includes all of the files required to boot and run the computer.
User data	Data that includes all data files saved and modified by users or applications that users run.
Application data	Data that includes files installed by an application and application configuration files.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.1 Implement tools to detect, remove, and prevent malware 3.1.3 Recover files corrupted by malware
CompTIA 220-1002	1.3 Summarize general OS installation considerations and upgrade methods. • File system types/formatting ○ HFS

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

- Best practices
  - Scheduled backups
- Tools
  - Backup/Time Machine
  - Restore/Snapshot

3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.

- Common solutions
  - Rebuild Windows profiles

4.3 Given a scenario, implement basic disaster prevention and recovery methods.

- Backup and recovery
  - Image level
  - File level
  - Critical applications
- Backup testing

Video/Demo	Time
12.11.1 System Backup	4:43
12.11.3 Create Backups in Windows	3:34
12.11.4 Create Backups in Linux	4:37
12.11.5 Use Time Machine on macOS	4:53
Total Video Time	**17:47**

Lab/Activity

- 12.11.6 Back Up the Computer
- 12.11.7 Configure File History

Fact Sheets

- 12.11.2 Backup Facts

Number of Exam Questions

7 questions

Total Time

About 54 minutes

12.12: System Recovery

Lecture Focus Questions:

- What system recovery methods can you use when you are unable to boot the computer?
- When using a restore point, what happens to the system changes that have been made since the restore point was taken? What happens to the user data files?
- Which components does Startup Repair inspect to fix Windows boot problems?
- When should a system image backup be restored in the recovery process? Which other things should you try first?
- What are the advantages of using a recovery disc/partition to recover a system? What are the disadvantages of this method?
- What are the advantages of using the Reset Your PC or Refresh Your PC options to recover a system? What are the disadvantages of this method?
- What methods can you use to recover lost data files?

In this section, you will learn to:

- Boot using a Windows installation disc and repair an installation
- Revert the system to an earlier restore point
- Restore user data using previous versions, File History, or from backup
- Restore a system using a system image
- Refresh or reset the system

Key terms for this section include the following:

Terms	Definitions
System Sestore	A Windows utility that enables you to restore your system to a previous state if System Protection is turned on.
Startup Repair	A Windows utility that restores many of the Windows files needed for a successful boot.
Safe Mode	The process of launching Windows with a minimum configuration, eliminating unnecessary software, and reducing Windows startup to only essential processes usually done for troubleshooting purposes.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.5 Implement disaster prevention and recovery methods 2.5.1 Implement image level backup and recovery 2.5.2 Implement file level backup and recovery

CompTIA 220-1002	3.1 Implement tools to detect, remove, and prevent malware
	3.1.2 Restore a PC or mobile device
	
	1.5 Given a scenario, use Microsoft operating system features and tools.
	
	• 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.
	
	• System
	  ○ Performance (virtual memory)
	  ○ Remote settings
	  ○ System protection
	
	1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop operating systems.
	
	• Tools
	  ○ Restore/Snapshot
	  ○ Image recovery
	
	3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.
	
	• Common solutions
	  ○ Disable Windows services/applications
	  ○ Rebuild Windows profiles

Video/Demo	Time
12.12.1 Windows 10 System Recovery	5:18
12.12.2 Use Restore Points	8:25
12.12.4 Use Windows System Recovery Tools	6:19
12.12.6 Use File Recovery Tools	7:54
12.12.8 Restore Data on Linux	3:27
12.12.9 Restore Data on macOS	3:58
Total Video Time	**35:21**

Lab/Activity

- 12.12.3 Create a Restore Point
- 12.12.5 Boot into the Windows Recovery Environment
- 12.12.7 Restore Data from File History

Fact Sheets

- 12.12.10 System Recovery Facts

Number of Exam Questions

9 questions

Total Time

About 86 minutes

12.13: Virtual Memory

Lecture Focus Questions:

- What is the benefit of using virtual memory?
- How does virtual memory work? What is the purpose of swapping?
- What is the benefit of using a separate hard disk for the paging file?
- What condition causes *disk thrashing*? How can you reduce its effects?

In this section, you will learn to:

- Monitor system memory utilization in Task Manager
- Configure page file settings
- Move the paging file to a different hard disk
- Create multiple paging files
- Troubleshoot disk thrashing

Key terms for this section include the following:

Terms	Definitions
Virtual memory	Simulated memory that is implemented as a page file on a hard drive.
Paging	The process of moving data from RAM to hard disk and back again. This process is also called swapping.
Virtual Memory Manager (VMM)	The utility in charge of swapping data between physical memory and the hard disk.
Disk Thrashing	When the amount of physical memory is so low that data must constantly be moved from physical RAM, to disk, and then back again.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	1.6 Given a scenario, use Microsoft Windows Control Panel utilities.
	• System
	  ○ Performance (virtual memory)
	  ○ Remote settings
	  ○ System protection

Video/Demo	Time
12.13.1 Windows Virtual Memory	6:57
12.13.2 Manage the Paging File	7:12

Total Video Time **14:09**

Lab/Activity

- 12.13.4 Configure Virtual Memory

Fact Sheets

- 12.13.3 Virtual Memory Facts

Number of Exam Questions

6 questions

Total Time

About 38 minutes

12.14: Operating System Troubleshooting

Lecture Focus Questions:

- An application displays an error message about missing files when you try to start it. What should you do?
- An application displays an error message about insufficient privileges when you try to start it. What should you do?
- A service fail to start when Windows loads. What should you do?
- An application running on the system has hung. What should you do?
- A process requires a higher priority level than the other processes running on the system. What should you do?
- The Windows system generates a BSOD error. What should you do?

In this section, you will learn to:

- Troubleshoot application crashes
- Run an application with elevated privileges on the system
- Troubleshoot hung applications
- Configure application priority and processor affinity
- Troubleshoot services and devices that fail to start on boot
- Troubleshoot system crashes

Key terms for this section include the following:

Terms	Definitions
Blue screen of death (BSOD)	On a Windows machine, an error that is so severe that Windows can no longer continue to function.
Pinwheel of death	On Mac OS, you may see the cursor turn into a pinwheel, and you won't be able to do anything.
Windows Compatibility Mode	A feature that emulates the operating system an older application was originally intended for.
Windows Error Reporting	A feature of Windows that enables Microsoft to be notified of application faults, system unresponsiveness, and kernel defects.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	4.2 Troubleshoot software components 4.2.1 Troubleshoot common issues 4.2.2 Apply common solutions
CompTIA 220-1002	1.3 Summarize general OS installation considerations and upgrade methods.

- Application compatibility

3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.

- Common symptom
  - Black screens
  - Slow profile load
- Common solutions
  - Apply updates

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

- Common symptoms
  - System/application log errors

4.8 Identify the basics of scripting.

- Environment variables

Video/Demo	Time
12.14.1 Windows Operating System Issues	8:23
12.14.2 Troubleshoot Windows Applications	11:16
12.14.3 Troubleshoot Windows Services	5:12
12.14.5 System Lockups	6:02
Total Video Time	**30:53**

Fact Sheets

- 12.14.4 Application Troubleshooting Facts
- 12.14.6 System Errors Facts

Number of Exam Questions

4 questions

Total Time

About 45 minutes

12.15: Windows Boot Errors

Lecture Focus Questions:

- What are the general stages of the Windows startup process?
- What should you do if you hear a series of beeps when the system powers on and there is nothing on the monitor?
- How do you correct a corrupt MBR or partition table?
- What symptoms might indicate a corrupt or missing boot sector?
- If you receive an error about corrupt or missing system files, how can you replace the damaged or missing files?

In this section, you will learn to:

- Diagnose and correct errors with system power
- Diagnose and correct system component errors
- Recover from partition and boot record errors
- Access the Advanced Startup Options menu to customize how the system starts and to correct problems
- Edit the device priority list in the BIOS/UEFI to include and exclude device types from the boot order
- Modify the hard drive list to identify the order that the BIOS/UEFI should search when booting from a hard disk
- Troubleshoot failure to boot issues

Key terms for this section include the following:

Terms	Definitions
Basic Input/Output System (BIOS)	An older specification that controls much of a computer's input/output functions, such as communication with the keyboard and the monitor.
Unified Extensible Firmware Interface (UEFI)	A newer specification that defines the software interface between an operating system and a computer's firmware.
Booting	The process of starting up a computer and loading an operating system.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	1.2 Configure hardware components 1.2.1 Configure boot options 4.1 Troubleshoot hardware components 4.1.1 Troubleshoot system startup

CompTIA 220-1002	4.1.6 Troubleshoot malfunctioning systems
	
	1.4 Given a scenario, use appropriate Microsoft command line tools.
	
	• sfc
	
	3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.
	
	• Common solutions
	  ○ Update boot order
	  ○ Reboot

Video/Demo	Time
12.15.1 Windows Boot Process	4:58
12.15.3 Modify the Boot Order	7:54
12.15.5 Using Advanced Boot Options	6:56
12.15.7 Use the bootrec Command	4:22
Total Video Time	**24:10**

Lab/Activity

- 12.15.4 Configure the Boot Order
- 12.15.9 Troubleshoot System Startup 1
- 12.15.10 Troubleshoot System Startup 2
- 12.15.11 Troubleshoot System Startup 3
- 12.15.12 Troubleshoot System Startup 4

Fact Sheets

- 12.15.2 Boot Process Facts
- 12.15.6 Windows Boot Options
- 12.15.8 Startup Error Facts

Number of Exam Questions

13 questions

Total Time

About 113 minutes

13.1: Security Best Practices

Lecture Focus Questions:

- How does the principle of least privilege apply to workstation security?
- What are the characteristics of a strong password?
- How can file and folder permissions be used to restrict access to information on a workstation?
- Which default Windows user accounts should you secure?
- How does the autorun feature in Windows reduce a workstation's security?
- How does an acceptable use policy increase system security?
- What role does user awareness play in system security?

Key terms for this section include the following:

Term	Definition
Principle lf least privilege	Users should have only the necessary degree of access to the workstation.
Autorun	Disable autorun.
Privacy filter	A polarized sheet of plastic to restrict screen visibility.
Organizational security policy	A high-level overview of the organization's security program.
Acceptable use policy (AUP)	Defines an employee's rights to use company property.
Password policy	Requirements for passwords used to authenticate to company-owned systems.
Code of ethics	Set of rules that define ethical behavior.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	2.2 Explain logical security concepts.
	• Trusted/untrusted software sources
	• Principle of least privilege
	
	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

    - Change default admin user account/password
- Disable autorun

4.1 Compare and contrast best practices associated with types of documentation.

- Acceptable use policy
- Password policy

4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.

- Follow all policies and security best practices

Video/Demo	Time
13.1.1 Best Practices for Securing Workstations	8:15
13.1.3 Security Policies	6:04
Total Video Time	**14:19**

Fact Sheets

- 13.1.2 Workstation Security Facts
- 13.1.4 Security Policy Facts

Number of Exam Questions

11 questions

Total Time

About 36 minutes

13.2: Incident Response

Lecture Focus Questions:

- What actions should be taken when an incident occurs?
- What types of things would a computer forensic investigator want to analyze if he selected a live analysis rather than a dead analysis?
- What methods can be used to save the contents of memory as part of a forensic investigation?
- How should you ensure the integrity of collected digital evidence?
- Why is chain of custody so important to forensic investigations?

Key terms for this section include the following:

Term	Definition
Incident response	The actions taken to deal with an incident during and after the incident.
Forensic investigation	Performed to gather evidence and identify the methods used in the attack.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	1.3 Summarize general OS installation considerations and upgrade methods.
	• File system types/formatting
	  ○ Swap partition
	
	4.1 Compare and contrast best practices associated with types of documentation.
	• Incident documentation
	• Regulatory and compliance policy
	
	4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.
	• Incident response
	  ○ First response
	  ○ Identify
	  ○ Report through proper channels
	  ○ Data/device preservation
	  ○ Use of documentation/documentation changes

- Chain of custody
- Tracking of evidence/documenting process

Video/Demo	Time
13.2.1 First Responder	5:20
13.2.2 Basic Forensic Procedures	11:34
Total Video Time	**16:54**

Fact Sheets

13.2.3 Incident Response Facts

Number of Exam Questions

7 questions

Total Time

About 29 minutes

13.3: Physical Security

Lecture Focus Questions:

- What precautions should you implement for good physical security for a building?
- How can you prevent laptops and their components from being stolen?
- How can you secure unattended Windows computers?
- What measures can you implement to protect data on stolen laptops?
- What are the best ways to securely dispose of magnetic media and optical media?
- How can you scrub data from a hard disk drive?

In this section, you will learn to:

- Configure remote wipe
- Require a screen saver password

Key terms for this section include the following:

Term	Definition
Building security	Access control to the location where the computers are located.
Hardware locks	Prevent theft of computers or components.
Computer tracking service	Helps locate stolen devices.
Removable storage	Easily removable data storage.
Mobile devices	Wired or wireless personal devices.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.2 Implement mobile device security 3.2.4 Implement remote wipe capabilities 3.3 Implement security best practices 3.3.2 Require a screen saver password
CompTIA 220-1002	2.1 Summarize the importance of physical security measures. • Door lock • Mantrap • Cable locks • Biometric locks • Badge reader

- Key fobs
- Smart card
- Hardware tokens
- Privacy screen
- Entry control roster
- Security guard
- Server locks
- USB locks

2.2 Explain logical security concepts.

- Access control lists
- DLP

2.9 Given a scenario, implement appropriate data destruction and disposal methods.

- Physical destruction
  - Shredder
  - Drill/hammer
  - Electromagnetic (Degaussing)
  - Incineration
  - Certificate of destruction
- Recycling or repurposing best practices
  - Low-level format vs. standard format
  - Overwrite
  - Drive wipe

4.1 Compare and contrast best practices associated with types of documentation.

- Regulatory and compliance policy
- Inventory management
  - Asset tags

Video/Demo	Time
13.3.1 Physical Security	8:34
13.3.2 Data Disposal and Destruction	5:39
13.3.3 Wipe a Disk	7:19
13.3.5 Configure a Screen Saver Password	3:52
Total Video Time	**25:24**

Lab/Activity

- 13.3.4 Configure Remote Wipe
- 13.3.6 Require a Screen Saver Password

Fact Sheets

- 13.3.7 Physical Security Facts

Number of Exam Questions

15 questions

Total Time

About 70 minutes

13.4: Social Engineering

Lecture Focus Questions:

- What characteristics of human nature does social engineering exploit?
- Who is usually the target of social engineering?
- How can dumpster diving give attackers valuable information?
- How can you prevent unauthorized persons from entering your facility?
- What are the characteristics of a phishing attack?
- What kind of information is classified as personally identifiable information?
- What are some industry or government regulations that protect customers from personal data theft?
- What is the best defense against a social engineering attack?

Key terms for this section include the following:

Term	Definition
Dumpster diving	The process of looking in the trash for sensitive information that has not been properly disposed of.
Shoulder surfing	Looking over the shoulder of someone working on a computer.
Piggybacking	An attacker entering a secured building by following an authorized employee.
Masquerading	Convincing personnel to grant access to sensitive information by pretending to be someone who is authorized.
Eavesdropping	An unauthorized person listening to sensitive conversations.
Phishing	Uses an email and a spoofed website to gain sensitive information.

This section helps you prepare for the following certification exam objectives:

Exam	Objective

CompTIA 220-1002	4.6 Explain the processes for addressing prohibited content/activity, and privacy, licensing, and policy concepts.
	• Regulated data
	  ○ PII
	  ○ PCI
	  ○ GDPR
	  ○ PHI

Video/Demo	Time
13.4.1 Social Engineering	10:09
Total Video Time	**10:09**

Fact Sheets

- 13.4.2 Social Engineering Facts

Number of Exam Questions

12 questions

Total Time

About 28 minutes

13.5: BIOS/UEFI Security

Lecture Focus Questions:

- What is the difference between a user password and an administrator password in the BIOS/UEFI configuration?
- How can BIOS/UEFI passwords be circumvented on some systems?
- How does chassis intrusion detection help to secure the BIOS?
- How does a hard disk password differ from a BIOS/UEFI password? What happens to the hard disk password if the disk is moved to another system?
- What is the function of the TPM? Where is the TPM chip located?
- Which UEFI security feature ensures that firmware updates for the motherboard do not contain malware?
- Which UEFI security feature prevents the system from booting an operating system without a valid digital signature?

In this section, you will learn to:

- Configure BIOS/UEFI security

Key terms for this section include the following:

Term	Definition
Drive locking	Setting a password on the system hard disk.
Chassis intrusion detection	A motherboard feature that helps you identify when a system case has been opened.
Trusted Platform Module (TPM)	A special chip on the motherboard that generates and stores cryptographic keys.
Lo-jack	A mechanism used to secure systems that are vulnerable to theft.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.3 Implement security best practices 3.3.7 Configure BIOS/UEFI security settings 3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.

CompTIA 220-1001	• BIOS/UEFI settings
	  ○ Firmware updates
	  ○ Security settings
	  ○ Interface configurations
	  ○ Passwords

CompTIA 220-1002	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

Video/Demo	Time
13.5.1 BIOS/UEFI Security	8:28
13.5.2 Configure BIOS/UEFI Security Settings	7:59
Total Video Time	**16:27**

Lab/Activity

- 13.5.4 Configure BIOS/UEFI Security

Fact Sheets

- 13.5.3 BIOS/UEFI Security Facts

Number of Exam Questions

7 questions

Total Time

About 41 minutes

13.6: Malware Protection

Lecture Focus Questions:

- What is the role of a signature file when using anti-malware software to protect a system?
- How often should the signature files be updated?
- Why does showing file extensions help to protect against malware?
- What are some common symptoms that might make you suspect that your system is infected with malware?
- When your system is infected with malware, what remediation actions can you take?
- What happens when a file is quarantined?
- Why is user education often the best protection against malware?

In this section, you will learn to:

- Configure Windows Defender

Key terms for this section include the following:

Term	Definition
Scheduled scanning	A system feature that checks computer files for malware.
Offline scanning	A system feature that causes the system to reboot and Windows Defender to run a scan in an offline state.
Real-time protection	A software function that alerts you when spyware attempts to install itself or run on your computer.
Cloud-based protection	A feature that provides real-time protection by sending Microsoft information about potential security threats discovered by Windows Defender.
Automatic sample submission	A software feature that allows Windows Defender to send information to Microsoft for use in analyzing and identifying new malware.
Malware	A type of software designed to take over or damage a computer without the user's knowledge or approval.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.1 Implement tools to detect, remove, and prevent malware 3.1.1 Install and configure anti-virus and anti-malware utilities
CompTIA 220-1001	2.5 Summarize the properties and purposes of services provided by networked hosts.

CompTIA 220-1002

- Server roles
  - Mail server

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

- Best practices
  - Antivirus/Anti-malware updates

2.2 Explain logical security concepts.

- Antivirus/Anti-malware

2.4 Given a scenario, detect, remove, and prevent malware using appropriate tools and methods.

- Malware
  - Spyware
  - Virus
  - Worm
  - Trojan
  - Rootkit
  - Ransomware
  - Keylogger
  - Botnet

2.5 Compare and contrast social engineering, threats, and vulnerabilities.

- Social engineering
  - Phishing
  - Spear phishing
  - Shoulder surfing
  - Impersonation
  - Tailgating
  - Dumpster diving
- Spoofing
- Zero-day
- Zombie
- Brute force
- Dictionary
- Non-compliant systems
- Man-in-the-middle

- DDoS
- DoS
- Rainbow table

3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.

- Common solutions
  - Reimage/reload OS

3.3 Given a scenario, use best practice procedures for malware removal.

1. Identify and research malware symptoms.
2. Quarantine the infected systems.
3. Disable System Restore (in Windows).
4. Remediate the infected systems.
   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.

Video/Demo	Time
13.6.1 Malware	10:50
13.6.3 Malware Protection	8:37
13.6.4 Implement Malware Protection on Windows	7:19
13.6.7 Implement Malware Protection on Linux	7:34
13.6.8 Implement Malware Protection on macOS	7:01
Total Video Time	**41:21**

Lab/Activity

- 13.6.6 Configure Windows Defender

Fact Sheets

- 13.6.2 Malware Facts
- 13.6.5 Windows Defender Facts
- 13.6.9 Malware Protection Facts

Number of Exam Questions

15 questions

Total Time
About 84 minutes

13.7: Authentication

Lecture Focus Questions:

- What is the difference between local authentication and domain authentication?
- What are the key characteristics of a strong password?
- Which tool would you use to configure a computer to require complex passwords for local user accounts?
- What is the difference between a locked account and a disabled account?
- What policies can you configure on a Windows workstation to defend yourself against a brute-force password attack?
- What authentication mechanisms can be used to log on to a Windows workstation?

In this section, you will learn to:

- Enforce password settings
- Manage Linux passwords

Key terms for this section include the following:

Term	Definition
Dictionary attack	Tries to guess a user's password using a list of words from a dictionary.
Hybrid attack	Adds appendages to known dictionary words.
Brute force attack	Tries to identify a user's password by exhaustively working through all possibilities

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.3 Implement security best practices 3.3.1 Enforce password settings
CompTIA 220-1001	2.4 Compare and contrast wireless networking protocols. • RFID

CompTIA 220-1002	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

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
    - Password reset/unlock account

4.8 Identify the basics of scripting.

- Environment variables

Video/Demo	Time
13.7.1 Authentication	8:41
13.7.2 Elevate Privileges on Linux	6:04
13.7.3 Configure Password Policies on Windows	10:41
13.7.7 Manage Authentication on Windows	6:49
13.7.8 Use a Biometric Scanner	2:47
13.7.9 Use a Smart Card Reader	3:24
Total Video Time	**38:26**

Lab/Activity

- 13.7.5 Enforce Password Settings
- 13.7.6 Manage Linux Passwords

Fact Sheets

- 13.7.4 Password Facts
- 13.7.10 Authentication Management Facts

Number of Exam Questions

15 questions

Total Time

About 88 minutes

13.8: File Encryption

Lecture Focus Questions:

- Which encryption method encrypts individual files so that only itsowner and authorized users can decrypt the file and read it?
- Why is it important to not move files that have been encrypted with EFS to a non-NTFS partition?
- How does file encryption differ from disk encryption?
- What is the role of a TPM when implementing whole disk encryption?
- Which editions of Windows provide BitLocker support?
- How can BitLocker be implemented on Windows systems lacking a TPM chip on the motherboard?
- What protocols are commonly used to establish a VPN? Which protocol is typically used for web transactions?
- What protocols are commonly used to encrypt and secure wireless communications?

In this section, you will learn to:

- Configure file encryption

Key terms for this section include the following:

Term	Definition
File encryption	Encrypts individual files so that only the user who created the file can open it.
Disk encryption	Encrypts the entire contents of a hard drive.
Data transmission encryption	Protects data sent through a network.
BitLocker partition	A volume that contains the boot files.
Trusted Platform Module (TPM)	A special hardware chip that generates and stores cryptographic keys.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.3 Implement security best practices 3.3.4 Implement drive encryption 1.2 Compare and contrast features of Microsoft Windows versions.

CompTIA 220-1002	• Corporate vs. personal needs
	  ○ EFS
	  ○ Bitlocker

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

- BitLocker

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

- EFS
- BitLocker
- BitLocker To Go

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

- Data encryption

Video/Demo	Time
13.8.1 File Encryption	5:23
13.8.3 Encrypt Files	7:07
13.8.5 BitLocker	5:44
13.8.7 Use BitLocker	6:00
Total Video Time	**24:14**

Lab/Activity

- 13.8.4 Configure File Encryption

Fact Sheets

- 13.8.2 File Encryption Facts
- 13.8.6 BitLocker Facts

Number of Exam Questions

10 questions

Total Time

About 57 minutes

13.9: Network Security

Lecture Focus Questions:

- How can you secure physical access to computer systems?
- What configuration changes could you make to prevent data loss on a Windows system?
- What are the characteristics of a strong password?
- How can you limit wired network connectivity to only authorized systems?
- How can you make it more difficult for an unauthorized person to connect to a wired network?
- Which network devices should be put in a DMZ? Which systems should not?
- What is the role of a content filter?
- What can you do to obscure a wireless network?
- How can you prevent data emanation from a wireless network?

Key terms for this section include the following:

Term	Definition
MAC address filtering	A feature that restricts access to the wired network switch to hosts that have specific MAC addresses.
Wi-Fi Protected Setup (WPS)	A network security standard that makes wireless networks easier to manage.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
CompTIA 220-1001	2.3 Given a scenario, install and configure a basic wired/wireless SOHO network. • Firewall settings ○ MAC filtering 2.2 Explain logical security concepts. • Port security • MAC address filtering

CompTIA 220-1002	2.7 Given a scenario, implement security best practices to secure a workstation.
	• Account management
	  ○ Disabling guest account
	  ○ Basic Active Directory functions
	  ○ Disable account

2.10 Given a scenario, configure security on SOHO wireless and wired networks.

- Wireless specific
  - Changing default SSID
  - Setting encryption
  - Disabling SSID broadcast
  - Antenna and access point placement
  - Radio power levels
  - WPS
- 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

Video/Demo	Time
13.9.1 Wired Network Security Best Practices	9:53
13.9.3 Wireless Network Security Best Practices	9:50
Total Video Time	**19:43**

Fact Sheets

- 13.9.2 Wired Network Security Facts
- 13.9.4 Wireless Network Security Facts

Number of Exam Questions

11 questions

Total Time

About 41 minutes

13.10: Firewalls

Lecture Focus Questions:

- Why is using a firewall important when connecting your computer to the internet?
- What is the difference between host-based and network-based firewall solutions?
- What information does the firewall use to allow or prevent communication?
- How would you configure Windows Firewall to allow network traffic generated by a specific application installed on the system? How would you allow a specific IP port number?
- What capabilities does configuring *port forwarding* provide?
- How would you configure port triggering?
- What are the advantages of implementing an all-in-one security appliance? What are the disadvantages?

In this section, you will learn to:

- Configure a Windows firewall

Key terms for this section include the following:

Term	Definition
Firewall	A device that inspects network traffic and allows or blocks traffic based on a set of rules.
Network appliances	Devices that are dedicated to providing certain network services.
Intrusion detection system (IDS)	A feature that detects intrusion attempts and alerts the system administrator.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.3 Implement security best practices 3.3.5 Configure a firewall 2.5 Summarize the properties and purposes of services provided by networked hosts.

CompTIA 220-1001	• Server roles
	  ○ syslog
	• Internet appliance
	  ○ UTM
	  ○ IDS
	  ○ IPS
	  ○ End-point management server

CompTIA 220-1002	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
	
	1.6 Given a scenario, use Microsoft Windows Control Panel utilities.
	
	• Windows Firewall
	
	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop.
	
	• Firewall settings
	  ○ Exceptions
	  ○ Configuration
	  ○ Enabling/disabling Windows Firewall
	
	2.2 Explain logical security concepts.
	
	• Firewalls
	• Email filtering
	
	2.4 Given a scenario, detect, remove, and prevent malware using appropriate tools and methods.
	
	• Tools and methods
	  ○ Software firewalls

Video/Demo	Time
13.10.1 Firewalls	9:58
13.10.2 Configure Windows Firewall	5:53
13.10.5 Network Appliances	3:10
Total Video Time	**19:01**

Lab/Activity

- 13.10.4 Configure a Windows Firewall

Fact Sheets

- 13.10.3 Firewall Facts
- 13.10.6 Network Appliance Facts

Number of Exam Questions

14 questions

Total Time

About 56 minutes

13.11: Proxy Servers

Lecture Focus Questions:

- What is the function of a proxy server? How can it be used to control internet traffic?
- What other functions can a proxy server perform?
- What should you do if Internet Explorer doesn't automatically detect a proxy server?

In this section, you will learn to:

- Use a proxy server

Key terms for this section include the following:

Term	Definition
Proxy server	A specific implementation of a firewall that uses filter rules to allow or deny internet traffic.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.3 Implement security best practices 3.3.6 Use a proxy server
CompTIA 220-1001	2.5 Summarize the properties and purposes of services provided by networked hosts. • Server roles ○ Proxy server
CompTIA 220-1002	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop. • Proxy settings

Video/Demo	Time
13.11.1 Proxy Settings	5:39
13.11.2 Configure Proxy Settings	5:11
Total Video Time	**10:50**

Lab/Activity

- 13.11.4 Use a Proxy Server

Fact Sheets

13.11.3 Proxy Server Facts

Number of Exam Questions
6 questions

Total Time
About 34 minutes

13.12: VPN

Lecture Focus Questions:

- How does a remote access VPN differ from a host-to-host VPN?
- With a site-to-site VPN, which devices are configured as the VPN tunnel endpoints?
- What does PPTP use for encryption? What does L2TP use?
- What is the difference between AH and ESP used with IPsec?
- Why would you want to use SSL VPNs when creating VPNs?

In this section, you will learn to:

- Configure a VPN connection

Key terms for this section include the following:

Term	Definition
PPTP	Point-to-Point Tunneling Protocol
L2TP	Layer Two Tunneling Protocol
L2TP	Layer Two Tunneling Protocol
IPsec	Internet Protocol Security
SSL	Secure Sockets Layer
GRE	Generic Routing Encapsulation

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	2.6 Implement remote access 2.6.2 Configure a VPN connection
CompTIA 220-1001	2.6 Explain common network configuration concepts. • VPN
CompTIA 220-1002	1.8 Given a scenario, configure Microsoft Windows networking on a client/desktop. • Establish networking connections ○ VPN 2.2 Explain logical security concepts. • VPN

	4.9 Given a scenario, use remote access technologies. • Security considerations of each access method

Video/Demo	Time
13.12.1 Virtual Private Networks (VPN)	9:00
13.12.2 Set Up a VPN Connection	3:13
Total Video Time	**12:13**

Lab/Activity

- 13.12.4 Configure a VPN Connection

Fact Sheets

- 13.12.3 VPN Facts

Number of Exam Questions

9 questions

Total Time

About 39 minutes

13.13: Security Troubleshooting

Lecture Focus Questions:

- What key preventative measures can you employ to increase the overall security of your computers and network?
- A user reports that someone on the internet is using her Gmail account to send spam. How did this happen?
- A malicious individual has set up a fake website that looks identical to a major bank's website. Users trying to connect to the legitimate site are redirected to the malicious site. How did this happen?
- A user reports that a pop-up window is displayed on his computer indicating he has a virus. What should you tell him to do?
- What are the symptoms of a malware infection?
- What is the proper procedure for removing malware from a system?

Key terms for this section include the following:

Term	Definition
Spoofing	Hiding the true source of packets or redirecting traffic to another location.
Phishing emails	The process attackers use to acquire sensitive information by masquerading as a trustworthy entity.
Pharming	Redirects one website's traffic to a bogus website that looks like the real website.
Cookies	Data files placed on a client system by a web server for retrieval at a later time.
Browser history	Contain information that an attacker can exploit.

This section helps you prepare for the following certification exam objectives:

Exam	Objective
TestOut PC Pro	3.1 Implement tools to detect, remove, and prevent malware 3.1.1 Install and configure anti-virus and anti-malware utilities 1.7 Summarize application installation and configuration concepts.
CompTIA 220-1002	• Security considerations ◦ Impact to device ◦ Impact to network

2.4 Given a scenario, detect, remove, and prevent malware using appropriate tools and methods.

- Tools and methods
  - 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
  - Automated replies from unknown sent email
  - Access denied
  - Invalid certificate (trusted root CA)

- System/application log errors

Video/Demo	Time
13.13.1 Common Security Issues	12:45
Total Video Time	**12:45**

Fact Sheets

- 13.13.2 Network Security Threat Facts
- 13.13.3 Security Troubleshooting Facts

Number of Exam Questions

10 questions

Total Time

About 33 minutes

14.0: Capstone Exercises

Summary

Lab/Activity

- 14.1 Build a Computer From Scratch
- 14.2 Troubleshoot a Malfunctioning Computer
- 14.3 Troubleshoot System Startup
- 14.4 Create a Home Office Network
- 14.5 Configure the Windows Operating System
- 14.6 Troubleshoot a Mobile Device
- 14.7 Configure Linux
- 14.8 Lab Sandbox

Total Time

About 96 minutes

Practice Exams

A.0: PC Pro Certification Practice Exams

PC Pro Certification Practice Exam (18 questions)

B.0: CompTIA A+ 220-1001 Core 1 Practice Exams

A+ 220-1001 Core 1 Certification Practice Exam (90 questions)

C.0: CompTIA A+ 220-1002 Core 2 Practice Exams

A+ 220-1002 Core 2 Certification Practice Exam (90 questions)

Appendix A: Approximate Time for the Course

The total time for the LabSim for TestOut PC Pro course is approximately **91 hours and 30 minutes**. Time is calculated by adding the approximate time for each section which is calculated using the following elements:

- Video/demo times
- Text Lessons (5 minutes assinged per text lesson)
- Simulations (12 minutes assigned per simulation)
- Questions (1 minute per question)

Additionally, there are approximately another **42 hours and 58 minutes** of Practice Test material at the end of the course.

The breakdown for this course is as follows:

Module Sections	Time	Videos	Labs	Text	Exams
1.0: Computing Overview					
1.1: Course Introduction	55	31	24	0	0
1.2: Hardware Basics	62	20	12	15	15
1.3: Windows Basics	31	13	0	10	8
1.4: Linux Basics	60	23	24	5	8
1.5: macOS Basics	34	21	0	5	8
Total	**4:02**	**1:48**	**1:00**	**0:35**	**0:39**
2.0: PC Technician Responsibilities					
2.1: Protection and Safety	50	20	0	15	15
2.2: Professionalism	26	6	0	5	15
2.3: Change Management	15	5	0	5	5
2.4: PC Tools	25	6	0	5	14
2.5: PC Maintenance	58	24	12	10	12
2.6: Troubleshooting Process Overview	27	8	0	5	14
Total	**3:21**	**1:09**	**0:12**	**0:45**	**1:15**
3.0: System Components					
3.1: Cases and Form Factors	19	7	0	5	7
3.2: Power Supplies	49	18	12	5	14
3.3: Motherboards and Buses	47	11	12	10	14
3.4: Motherboard Troubleshooting	41	9	24	5	3
3.5: Processors	78	19	24	20	15
3.6: Processor Troubleshooting	47	7	24	5	11
3.7: Memory	46	24	0	10	12
3.8: Memory Installation	78	30	24	10	14
3.9: Memory Troubleshooting	51	12	24	5	10
3.10: BIOS/UEFI	83	40	24	5	14
3.11: Expansion Cards	29	9	12	5	3
3.12: Video	49	12	12	10	15

3.13: Audio		65	25	12	15	13
3.14: Cooling		24	8	0	5	11
	Total	**11:46**	**3:51**	**3:24**	**1:55**	**2:36**
4.0: Peripheral Devices						
4.1: Peripheral Devices		27	4	12	5	6
4.2: USB		36	7	12	5	12
4.3: Display Devices		55	25	12	5	13
4.4: Video Troubleshooting		26	9	0	5	12
4.5: Device Driver Management		79	43	12	10	14
4.6: Device Driver Troubleshooting		54	12	24	5	13
	Total	**4:37**	**1:40**	**1:12**	**0:35**	**1:10**
5.0: Storage						
5.1: Storage Devices		23	9	0	5	9
5.2: SATA		38	14	12	5	7
5.3: Optical Media		26	15	0	5	6
5.4: RAID		69	21	24	10	14
5.5: File Systems		61	32	0	15	14
5.6: File System Creation		68	30	24	5	9
5.7: Storage Management		44	21	12	5	6
5.8: Storage Spaces		42	20	12	5	5
5.9: Disk Optimization		66	40	12	5	9
5.10: Storage Troubleshooting		50	13	12	10	15
	Total	**8:07**	**3:35**	**1:48**	**1:10**	**1:34**
6.0: Networking						
6.1: Networking Overview		52	32	0	10	10
6.2: Network Hardware		57	21	12	10	14
6.3: Networking Media		47	12	0	20	15
6.4: Ethernet		24	5	0	10	9
6.5: IP Networking		40	15	0	10	15
6.6: IP Configuration		66	24	24	5	13
6.7: IP Version 6		19	6	0	5	8
6.8: Internet Connectivity		71	16	36	5	14
6.9: Network Utilities		103	35	48	5	15
6.10: Network Troubleshooting		65	23	24	5	13
	Total	**9:04**	**3:09**	**2:24**	**1:25**	**2:06**
7.0: Wireless Networking						
7.1: 802.11 Wireless		91	21	48	10	12
7.2: Infrared, Bluetooth, and NFC		27	11	0	5	11
7.3: SOHO Configuration		69	29	12	15	13
7.4: Internet of Things		40	18	12	5	5
7.5: Wireless Network Troubleshooting		21	10	0	5	6
	Total	**4:08**	**1:29**	**1:12**	**0:40**	**0:47**
8.0: Printing						
8.1: Printers		66	19	12	20	15
8.2: Printer Configuration		42	19	12	5	6
8.3: Network Printing		42	20	12	5	5
8.4: Printing Management		51	17	24	5	5

8.5: Printer Maintenance		23	11	0	5	7
8.6: Printer Troubleshooting		42	22	0	5	15
	Total	**4:26**	**1:48**	**1:00**	**0:45**	**0:53**
9.0: Mobile Devices						
9.1: Laptops		35	11	0	10	14
9.2: Laptop Components		51	31	0	5	15
9.3: Laptop Power Management		53	12	24	10	7
9.4: Laptop Troubleshooting		42	12	0	15	15
9.5: Mobile Devices		32	10	0	15	7
9.6: Mobile Device Networking		52	14	12	15	11
9.7: Mobile Device Security		45	13	12	5	15
9.8: Mobile Device Troubleshooting		33	14	0	5	14
	Total	**5:43**	**1:57**	**0:48**	**1:20**	**1:38**
10.0: System Implementation						
10.1: Component Selection		22	7	0	5	10
10.2: Windows Pre-Installation		40	20	0	10	10
10.3: Windows Installation		63	26	24	5	8
10.4: Post-Installation		17	7	0	5	5
10.5: Virtualization		103	37	36	15	15
	Total	**4:05**	**1:37**	**1:00**	**0:40**	**0:48**
11.0: File Management						
11.1: Windows File Locations		32	15	0	10	7
11.2: Manage Files on Windows		100	46	24	15	15
11.3: NTFS Permissions		45	17	12	5	11
11.4: Shared Folders		55	27	12	5	11
11.5: Linux File Management		75	39	24	5	7
	Total	**5:07**	**2:24**	**1:12**	**0:40**	**0:51**
12.0: System Management						
12.1: Windows System Tools		107	55	12	25	15
12.2: Preferences and Settings		24	14	0	5	5
12.3: Performance Monitoring		29	15	0	5	9
12.4: Active Directory		116	46	48	10	12
12.5: Users and Groups		64	26	12	15	11
12.6: Remote Services		70	33	12	15	10
12.7: Windows Application Management		72	34	24	10	4
12.8: Linux Application Management		39	16	12	5	6
12.9: Digital Content Management		27	17	0	5	5
12.10: Updates		62	25	24	5	8
12.11: System Backup		54	18	24	5	7
12.12: System Recovery		86	36	36	5	9
12.13: Virtual Memory		38	15	12	5	6
12.14: Operating System Troubleshooting		45	31	0	10	4
12.15: Windows Boot Errors		113	25	60	15	13
	Total	**15:46**	**6:46**	**4:36**	**2:20**	**2:04**
13.0: Security						
13.1: Security Best Practices		36	15	0	10	11
13.2: Incident Response		29	17	0	5	7

13.3: Physical Security		70	26	24	5	15
13.4: Social Engineering		28	11	0	5	12
13.5: BIOS/UEFI Security		41	17	12	5	7
13.6: Malware Protection		84	42	12	15	15
13.7: Authentication		88	39	24	10	15
13.8: File Encryption		57	25	12	10	10
13.9: Network Security		41	20	0	10	11
13.10: Firewalls		56	20	12	10	14
13.11: Proxy Servers		34	11	12	5	6
13.12: VPN		39	13	12	5	9
13.13: Security Troubleshooting		33	13	0	10	10
	Total	**10:36**	**4:29**	**2:00**	**1:45**	**2:22**

Total Course Time 91:30

Practice Exams

A.0: PC Pro Certification Practice Exams	Number of Questions	Time
A.2: PC Pro Certification Practice Exams - All Questions	109	21:48
A.3: PC Pro Certification Practice Exam	18	2:00
Total	**127**	**23:48**

B.0: CompTIA A+ 220-1001 Core 1 Practice Exams	Number of Questions	Time
B.2: CompTIA A+ 220-1001 Core 1 Practice Exams - 20 Random	100	1:40
B.3: CompTIA A+ 220-1001 Core 1 Practice Exams - All	415	6:55
B.4: A+ 220-1001 Core 1 Certification Practice Exam	90	1:30
Total	**605**	**10:05**

C.0: CompTIA A+ 220-1002 Core 2 Practice Exams	Number of Questions	Time
C.2: CompTIA A+ 220-1002 Core 2 Practice Exams - 20 Random	80	1:20
C.3: CompTIA A+ 220-1002 Core 2 Practice Exams - All	375	6:15
C.4: A+ 220-1002 Core 2 Certification Practice Exam	90	1:30
Total	**90**	**9:05**

Total Practice Exam Time 42:58