



# *Lesson Plans*

**A+ Essentials**

(Exam 220-701)

Version 8.0

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## **Course Overview**

This course prepares students for CompTIA's Exam 220-701: A+ Essentials. It focuses on basic operating system and hardware concepts.

### **Module 1 – Computing Overview**

This module introduces the students to the A+ certification exams, the basic skills a student should have before taking this course, and the content of the A+ Essentials course. Students will learn how to use the simulator to complete the lab exercises. This module also provides an overview of the basic elements and functions of computer hardware and operating systems.

### **Module 2 – PC Technician**

This module examines the roles of the PC technician; protection and safety of users and computers, acting in a professional manner, maintaining computer systems, troubleshooting systems, and utilizing Windows tools and utilities to view configuration information and manage computers.

### **Module 3 – System Components**

In this module students will learn concepts about the components that make up computer systems. Students will explore the basics of cases, form factors, power supplies, motherboards, PC expansion buses, processors, memory, BIOS, video, and cooling devices.

### **Module 4 – Peripheral Devices**

This module teaches the students about the following peripheral devices: IO interfaces, USB devices, IEEE 1394-based products, input devices, display devices, and sound devices. Students will also receive guidelines for installing devices.

### **Module 5 – Storage**

This module discusses concepts about the storage of digital data. Students will become familiar with storage devices, storage device interfaces, optical media, and file systems. They will also learn details about managing files, using RAID arrays, and optimizing hard disk performance.

### **Module 6 – Networking**

This module examines the fundamentals of networking. Student will learn of the components that make up a network. They will learn about network protocols, addressing, configurations, networking media (cabling), IP configuration settings, 802.11 wireless networks, Infrared (IrDA), and Bluetooth. They will also receive guidelines for troubleshooting network connections.

## **Module 7 – Printing**

In this module students will learn concepts about selecting, installing, configuring, and managing printers. They will learn about different types of printers, printer languages, and the components that make up network printing.

## **Module 8 – Portable Devices**

This module discusses portable computing devices. Topics covered include; classifications for portable devices, components in a notebook system, PC cards, batteries, and power management, and troubleshooting of a portable device.

## **Module 9 – Security**

In this module students will learn the basics of securing a computer system. Concepts covered include; protecting against malware and social engineering attacks, authenticating to validate a user, configuring BIOS security, utilizing encryption technologies, physically securing computer systems, and employing firewalls.

## **Module 10 – System Management**

This module discusses basic concepts of system management which include; installing and managing applications, updating Windows and non-Microsoft software, protecting a system through backups, managing virtual memory, handling system errors, and providing system recovery for a system that does not work properly.

## **Module 11 – Windows Installation**

This module examines decisions that should be made prior to installation, methods to install a Windows operating system, and post installation tasks.

## **Practice Exams**

In Practice Exams students will have the opportunity to test themselves and verify that they understand the concepts and are ready to take the certification exam.

## Section 1.1: Course Introduction

### Summary

The A+ certification is an entry-level certification. You should have a basic understanding of computers, including the following skills, before taking this course.

- Installing and running programs.
- Using basic productivity software including word processing applications.
- Saving files created by common applications.
- Browsing the Internet.

The A+ certification has been updated for 2009. To obtain the certification, you must pass two exams:

- The A+ Essentials exam (220-701) covers basic operating system and hardware concepts.
- The A+ Practical Application exam (220-702) covers details on installing and troubleshooting hardware and configuring devices for use by the operating system.

This course covers content for the A+ Essentials exam. TestOut training is also available for the A+ Practical Application exam. You should study the material in the Essentials course before studying for the Practical Application exam. If possible, we recommend that you study for both exams before taking either exam.

In addition to covering everything you need to know for the A+ Essentials exam, this course has been designed to help you:

- Set up a new computer.
- Identify system requirements when purchasing a new computer.
- Understand the technology and specifications used to describe computer components, and 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.

### Time

About 5 minutes

## **Section 1.2: Using the Simulator**

### **Summary**

This section introduces the student to the TestOut simulator, which is used in most of the lab exercises throughout the course. Students will become familiar with the:

- Scenario
- Bench
- Shelf
- Selected Component Details
- Processes to complete labs.
- Elements of the Score Report.

Students will learn how to:

- Read simulated component documentation and view components to make appropriate choices to meet the scenario.
- Add simulated computer components to the Bench.
- Change views and zoom in on objects on the Bench.
- Attach simulated cables.
- Use the simulation interface to identify where simulated cables connect to the computer.
- Use the simulated Windows desktop to complete software configuration tasks.

### **Time**

About 15 minutes

### **Lab/Activity**

- Explore the Lab Interface

## Section 1.3: Hardware Basics

### Summary

This section discusses the basic elements and functions of computers. Basics discussed include:

- Elements of a computer:
  - Hardware
  - Software
  - Firmware
- Functions that computers perform:
  - Input
  - Processing
  - Storage
  - Output
- Componentization
- Standardization
- Common types of ports and connectors

Students will learn how to:

- Connect common peripherals to standard ports.

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - I/O interfaces
    - Sound
    - Video
    - USB 1.1 and 2.0
    - Serial
    - IEEE 1394 / Firewire
    - Parallel
    - NIC
    - Modem
    - PS/2
- 4.2 Categorize network cables and connectors and their implementations
  - Connectors
    - RJ45
    - RJ11

### Lecture Focus Questions:

- What is the difference between hardware, software, and firmware?
- What 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?

**Time**

About 50 minutes

**Lab/Activity**

- Set Up a Computer

**Number of Exam Questions**

5 questions

## Section 1.4: Operating System Basics

### Summary

In this section students will learn the basics of operating systems. An operating system is a set of programs that acts as an interface between the applications that are running on a computer and the computer's hardware. Concepts covered in this section include:

- Actions performed by operating systems
- Operating system attributes:
  - Multi-processing
  - Multi-tasking
  - Multi-threading
- Parts of an operating system:
  - Kernel
  - Drivers
  - Interface
  - Utilities
  - Applications
- Types of Windows operating systems discussed in this course:
  - Windows 2000 Professional
  - Windows XP (Home and Professional)
  - Windows Vista (Home Premium, Business, and Ultimate)
  - Windows 7 (Home Premium, Professional, and Ultimate)
- Components of the Windows interface:
  - Desktop
  - Start Menu
  - Taskbar
  - System Tray
  - Windows Explorer
  - My Computer
  - Control Panel
  - Sidebar
  - Aero
  - Search
  - User Account Control (UAC)

Students will learn how to:

- Customize the Windows Taskbar.
- Add and remove gadgets in Windows Vista and Windows 7.

### A+ Essentials Objectives:

- 3.1 Compare and contrast the different Windows Operating Systems and their features

- Windows 2000, Windows XP, Windows Vista
  - Side bar, Aero, UAC
  - User interface, start bar layout
- 3.2 Given a scenario, demonstrate proper use of user interfaces
  - Windows Explorer
  - My Computer
  - Control Panel
  - Task bar / systray
  - Start Menu

**Lecture Focus Questions:**

- What are the functions of the *kernel*?
- What is the difference between a GUI and a CLI?
- How are Windows Explorer and My Computer similar?
- What type of information is shown on the Taskbar?
- Which Windows interface components would you use to switch from one running program to another?
- Which Windows versions include the Sidebar, Aero, and UAC?
- How does an index improve searching on your computer?

**Time**

About 40 minutes

**Number of Exam Questions**

5 questions

## Section 2.1: Protection and Safety

### Summary

This section examines the protection and safety of users and computers. Concepts covered include:

- Recommendations to provide personal safety of users.
- Awareness of hazardous issues.
- Measures to protect against Electrostatic Discharge (ESD).
- Proper disposal of equipment and hazardous chemicals.

Students will learn how to:

- Use an anti-static mat and strap to protect against ESD.
- Implement appropriate grounding procedures.

### A+ Essentials Objectives:

- 6.1 Outline the purpose of appropriate safety and environmental procedures and given a scenario apply them
  - ESD
  - Electrical safety
    - CRT
    - Power supply
    - Inverter
    - Laser printers
  - Material Safety Data Sheets (MSDS)
  - Cable management
    - Avoiding trip hazards
  - Physical safety
    - Heavy devices
    - Hot components
  - Environmental - consider proper disposal procedures

### Lecture Focus Questions:

- Which specific computer components require special care when handling to protect your safety?
- 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 it provides be important?

**Time**

About 40 minutes

**Number of Exam Questions**

14 questions

## Section 2.2: Professionalism

### Summary

This section provides information about acting in a professional manner when working as a PC technician. Concepts covered include:

- Creating good first impressions.
- Utilizing good communication skills.
- Dealing with customers in a respectful manner.
- Guidelines to follow when identify and resolving problems.

### A+ Essentials Objectives:

- 6.2 Given a scenario, demonstrate the appropriate use of communication skills and professionalism in the workplace
  - Use proper language - avoid jargon, acronyms, slang
  - Maintain a positive attitude
  - Listen and do not interrupt a customer
  - Be culturally sensitive
  - Be on time
    - If late contact the customer
  - Avoid distractions
    - Personal calls
    - Talking to co-workers while interacting with customers
    - Personal interruptions
  - Dealing with a difficult customer or situation
    - Avoid arguing with customers and/or being defensive
    - Do not minimize customers' 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
  - 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 materials
    - Located on computer, desktop, printer, etc.

### Lecture Focus Questions:

- What specific things can you do to improve your people skills?

- What actions and comments contribute to common stereotypes about PC technicians?
- 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?

**Time**

About 15 minutes

**Number of Exam Questions**

13 questions

## Section 2.3: PC Maintenance

### Summary

This section discusses considerations and guidelines that can be used to help maintain computer systems. Concepts covered include:

- Environmental considerations to create the proper environment for computer systems.
  - Heating, ventilation, and air conditioning (HVAC)
  - Interference
  - Magnetic fields
- Cleaning guidelines for a computer system.
- Tips for maintaining a computer.
- Types of power conditions.
- Devices used to prevent power problems.
  - Surge protector
  - Line conditioner
  - Standby Power Supply (SPS)
  - Uninterruptible Power Supply (UPS)

Students will learn how to:

- Connect a UPS to your computer.
- Configure UPS settings for notifications and shutdown.

### A+ Essentials Objectives:

- 2.5 Given a scenario, integrate common preventative maintenance techniques
  - Physical inspection
  - Use of appropriate repair tools and cleaning materials
    - Compressed air
    - Lint free cloth
    - Computer vacuum and compressors
  - Power devices
    - Appropriate source such as power strip, surge protector or UPS
  - Ensuring proper environment
  - Backup procedures
- 6.1 Outline the purpose of appropriate safety and environmental procedures and given a scenario apply them
  - EMI
    - Network interference
    - Magnets
  - RFI
    - Cordless phone interference
    - Microwaves

- Electrical safety
  - Matching power requirements of equipment with power distribution and UPSs

**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 and what can be done to prevent problems with it?
- How can a magnet affect a floppy disk or tape?
- 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 against over voltages?
- What is the difference between the way an online UPS provides power to a system and an offline UPS provides power?

**Time**

About 50 minutes

**Lab/Activity**

- Install a UPS

**Number of Exam Questions**

15 questions

## Section 2.4: Troubleshooting

### Summary

This section examines procedures for troubleshooting systems. Concepts covered include:

- A systematic approach to problem solving.
- Tips for troubleshooting systems.

### A+ Essentials Objectives:

- 2.1 Given a scenario, explain the troubleshooting theory
  - Identify the problem
    - Question the user and identify user changes to computer and perform backups before making changes
  - Establish a theory of probable cause (question the obvious)
  - Test the theory to determine cause
    - Once theory is confirmed determine next steps to resolve problem
    - If theory is not confirmed re-establish new theory or escalate
  - Establish a plan of action to resolve the problem and implement the solution
  - Verify full system functionality and if applicable implement preventative measures
  - Document findings, actions and outcomes
- 2.2 Given a scenario, explain and interpret common hardware and operating system symptoms and their causes
  - Use documentation and resources
    - User / installation manuals
    - Internet / web based
    - Training materials

### Lecture Focus Questions:

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

### Time

About 20 minutes

## **Number of Exam Questions**

12 questions

## Section 2.5: System Tools

### Summary

This section discusses Windows tools and utilities. System tools covered include:

- Control Panel
- Task Manager
- Microsoft Management Console (MMC)
- Computer Management
- Event Viewer
- Services
- Performance Monitor
- Reliability Monitor
- System Information (Msinfo32)
- System Configuration Utility (Msconfig)
- DirectX Diagnostic Tool (Dxdiag)
- Command Prompt
- Regedit

Students will learn how to:

- Use system tools to view current performance statistics.
- 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.

### A+ Essentials Objectives:

- 3.2 Given a scenario, demonstrate proper use of user interfaces
  - Control Panel
  - Run line utilities
    - REGEDIT
  - Administrative tools
    - Performance monitor, Event Viewer, Services, Computer Management
  - MMC
  - Task Manager

### Lecture Focus Questions:

- What are the differences between the Control Panel and Task Manager?
- Which tool lets you view running tasks and current memory use?
- What are the three types of events you might see in Event Viewer?

- What elements can affect the operating system's stability index that Reliability Monitor provides?
- 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, DxDiag?
- How should you normally modify settings in the registry?

**Time**

About 35 minutes

**Number of Exam Questions**

12 questions

## Section 3.1: Cases, Form Factors, and Power

### Summary

In this section students will explore basics about computer cases, form factors and power supplies. Details about the following concepts will be covered:

- Types of motherboards:
  - ATX
  - Mini-ATX
  - Micro-ATX
  - Mini-ITX
  - NLX
  - BTX
- Types of system cases:
  - Desktop
  - Tower
  - Small form factor (SFF)
  - Notebook
- Components of a system case
- Details about power supplies

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - Form Factor
    - ATX / BTX
    - micro ATX
    - NLX
- 1.3 Classify power supplies types and characteristics
  - AC adapter
  - ATX proprietary
  - Voltage, wattage and capacity
  - Voltage selector switch
  - Pins (20, 24)

### Lecture Focus Questions:

- Why must the case and the power supply be matched to the motherboard?
- How does the BTX form differ from the ATX form?
- What is the main difference between full, mid-, and mini-tower cases?
- What are the standard components typically included with a system case?
- How does the case form affect the type of power supply you purchase?
- What function does the red switch on a power supply perform? Why is this important?

- What is a *watt*? How does the watt rating for a power supply affect the devices you can use in a system?
- What is a *soft power* supply?
- Why must you be careful when using a proprietary power supply?

**Time**

About 40 minutes

**Lab/Activity**

- Troubleshoot System Power

**Number of Exam Questions**

9 questions

## Section 3.2: Motherboards and Buses

### Summary

This section discusses the details about motherboards and expansion buses in PC systems. Concepts covered include:

- The components of a typical motherboard:
  - Processor interface
  - Memory modules
  - Expansion slots
  - Onboard components
  - Faceplate connectors
  - Onboard internal connectors
  - BIOS chip
  - CMOS battery
  - Chipset
  - Jumpers
  - Documentation
- Common expansion buses in a PC system:
  - Peripheral Component Interconnect (PCI)
  - Mini-PCI
  - Accelerated Graphics Port (AGP)
  - Audio Model Riser (AMR)
  - Communications Network Riser (CNR)

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - Bus slots
    - PCI
    - AGP
    - PCIe
    - AMR
    - CNR
    - PCMCIA
  - Chipsets
  - Riser card / daughterboard
- 1.9 Summarize the function and types of adapter cards
  - Video
    - PCI
    - PCIe
    - AGP

**Lecture Focus Questions:**

- What factors will you consider when selecting a motherboard?
- What is the difference between the northbridge and southbridge chips on a motherboard?
- How can you add peripheral devices to a system?
- How are PCI and PCI Express different?
- What is the most common bus type for video cards on new motherboards?

**Time**

About 25 minutes

**Number of Exam Questions**

10 questions

## Section 3.3: Processors

### Summary

This section examines the basics of selecting a CPU. Concepts covered include:

- Considerations for choosing a processor:
  - Manufacturer
  - 32-bit or 64-bit processor
  - Speed
  - Multi-core
  - Cache
  - Process size
  - Hyper-threading
  - Throttling
  - Mobile processors
  - Virtualization
  - Integrated memory controller
  - Cooling
- Details about CPU performance

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - Processor sockets
- 1.4 Explain the purpose and characteristics of CPUs and their features
  - Identify CPU types
    - AMD
    - Intel
- Hyper threading
- Multi core
  - Dual core
  - Triple core
  - Quad core
  - Onchip cache
    - L1
    - L2
  - Speed (real vs. actual)
  - 32bit vs. 64 bit
- 3.1 Compare and contrast the different Windows Operating Systems and their features
  - Windows 2000, Windows XP 32bit vs. 64bit, Windows Vista 32 bit vs. 64bit
    - Terminology (32bit vs. 64bit - x86 vs. x64)

- Application compatibility

**Lecture Focus Questions:**

- What is the difference between the three 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 process 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?
- What three components are used with a CPU to dissipate heat?

**Time**

About 20 minutes

**Number of Exam Questions**

13 questions

## Section 3.4: Memory

### Summary

In this section students will learn about the factors that should be considered when selecting memory. Concepts covered include:

- Types of Random Access Memory (RAM):
  - Dynamic RAM (DRAM)
  - Static RAM (SRAM)
- RAM standards:
  - SDRAM (Synchronous Dynamic RAM)
  - DDR (Double-Data Rate Synchronous Dynamic RAM)
  - DDR2
  - DDR3
  - RDRAM (Rambus DRAM)
- Increasing memory bandwidth using multiple channels
- Types of generic form factor labels:
  - SIMM
  - DIMM
  - SO-DIMM
  - RIMM
- Considerations when selecting RAM:
  - Packaging (form)
  - Capacity
  - Frequency
  - CAS latency/timing
  - Error correction
  - Buffered (registered)
  - Single- or double-sided

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - Memory slots
    - RIMM
    - DIMM
    - SODIMM
    - SIMM
- 1.6 Compare and contrast memory types, characteristics and their purpose
  - Types
    - DRAM
    - SRAM
    - SDRAM
    - DDR / DDR2 / DDR3
    - RAMBUS
  - Parity vs. Non-parity

- ECC vs. non-ECC
- Single sided vs. double sided
  - Single channel vs. dual channel
  - Speed
    - PC100
    - PC133
    - PC2700
    - PC3200
    - DDR3-1600
    - DDR2-667

**Lecture Focus Questions:**

- How does RAM differ from ROM?
- What is the difference between SRAM and DRAM?
- What are two advantages of using DDR3 memory over DDR2 memory?
- What are two places where the memory controller might be located in modern PC systems?
- Why is consulting the motherboard documentation so important when purchasing memory?
- Which indicates a higher operating frequency, PC-2700 or DDR-400?
- 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?

**Time**

About 75 minutes

**Number of Exam Questions**

13 questions

## Section 3.5: BIOS

### Summary

This section examines information about the BIOS. Concepts covered include:

- Basic Input Output System (BIOS) details.
- Complementary Metal-Oxide Semiconductor (CMOS) details.
- Common reasons for editing the CMOS settings.
- The process to start up the system.

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - BIOS / CMOS / Firmware
    - POST
    - CMOS battery
- 3.4 Explain the basics of boot sequences, methods and startup utilities
  - Disk boot order / device priority
    - Types of boot devices (disk, network, USB, other)

### 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?

### Time

About 25 minutes

### Number of Exam Questions

4 questions

## Section 3.6: Video

### Summary

In this section students will learn about facts that should be considered when choosing a video card. Concepts covered include:

- Bus type
- Monitor interface
- Processing capabilities
- Multi-GPU
- Memory
- Display quality
- High-bandwidth Digital Content Protection (HDCP) support
- TV input and output
- HDMI audio
- DirectX/OpenGL

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - I/O interfaces
    - Video
- 1.7 Distinguish between the different display devices and their characteristics
  - Connector types
    - VGA
    - HDMi
    - S-Video
    - Component / RGB
  - Settings
    - Refresh rate
    - Resolution
    - Multi-monitor
- 1.9 Summarize the function and types of adapter cards
  - Video
    - PCI
    - PCIe
    - AGP
  - Multimedia
    - TV tuner cards
    - Capture cards

**Lecture Focus Questions:**

- How does the video card affect the quality of the image on the monitor?
- Which type of DVI connector can be used to send either analog or digital signals?
- How does the GPU increase the video performance?
- 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?
- What is the difference between ATSC and NTSC? Which format would you most likely choose if you wanted to watch broadcast TV in the United States?

**Time**

About 15 minutes

**Number of Exam Questions**

5 questions

## Section 3.7: Cooling

### Summary

This section discusses the following methods that can be used to cool the system:

- Heat sensors
- Fans
- Heat sink
- Rounded cables
- Liquid cooling
- Room temperature
- Ventilation

### A+ Essentials Objectives:

- 1.5 Explain cooling methods and devices
  - Heat sinks
  - CPU and case fans
  - Liquid cooling systems
  - Thermal compound
- 2.2 Given a scenario, explain and interpret common hardware and operating system symptoms and their causes
  - Hardware related symptoms
    - Excessive heat
    - Odors

### 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?
- When might you want to add liquid cooling to a computer?
- What is the difference between a heat sink and a heat spreader?
- What is the function of a thermal pad? When should it be used?

### Time

About 20 minutes

### Number of Exam Questions

7 questions

## Section 4.1: Serial, Parallel, and PS/2

### Summary

In this section students will learn the interfaces used for connecting devices to computer systems. Concepts covered include:

- Interfaces for connecting devices:
  - Serial devices
  - Parallel devices
  - PS/2 devices
- Identifying common connectors:
  - Serial Connectors
  - Parallel connectors
  - PS/2 Connectors

Students will learn how to:

- Select the correct port to use to install different peripheral devices.
- Install peripheral devices such as keyboards, serial devices, and parallel devices.

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - I/O interfaces
    - Serial
    - Parallel
    - PS/2
- 1.9 Summarize the function and types of adapter cards
  - I/O
    - Serial
    - Parallel

### Lecture Focus Questions:

- What is the difference between serial and parallel communications?
- Theoretically, which form of communication (serial or parallel) provides faster communication?
- Generally speaking, which form of communication (serial or parallel) will provide communication over longer distances without amplification?
- What is the relationship between the serial port and the COM ports? Between the parallel port and LPT ports?
- What is the difference between SPP and EPP standards?

- What are three ways you can tell the difference between a keyboard and mouse PS/2 port?
- How do you configure a computer to use EPP?

**Time**

About 30 minutes

**Lab/Activity**

- Connect Devices

**Number of Exam Questions**

5 questions

## Section 4.2: USB

### Summary

This section provides an overview of using USB devices to connect to computer system. Details about the following are presented:

- USB versions:
  - 1.0/1.1
  - 2.0
- Types of USB connectors:
  - A Connector
  - B Connector
  - Mini Connector (4 pin)
  - Mini Connector (5 pin)
- Methods to connect a USB device to a computer:
  - Directly to a USB port on a computer.
  - To an external USB hub.
- Types of USB devices:
  - Self-powered
  - Bus powered

Students will learn how to:

- Identify typical USB connectors and ports.
- Connect devices such as a printer and a camera.
- Select and install USB devices based on customer requirements.

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - I/O interfaces
    - USB 1.1 and 2.0
- 1.9 Summarize the function and types of adapter cards
  - I/O
    - USB

### Lecture Focus Questions:

- What are the differences between USB 1.1 and 2.0?
- What types of devices are typically self-powered? Bus-powered?
- What are the power requirements for a low-powered and high-powered bus powered-device?
- Where do you typically connect the B end of a USB cable?

**Time**

About 20 minutes

**Lab/Activity**

- Install USB Devices

**Number of Exam Questions**

4 questions

## Section 4.3: IEEE 1394 (Firewire)

### Summary

This section discusses using IEEE 1394 standards to create a high-performance serial bus. Details covered include:

- Trademarked names for IEEE 1394-based products
  - Firewire
  - i.Link
  - Lynx
- Firewire specifics
- IEEE 1394 standards
  - 1394
  - 1394.A
  - 1394.B
  - 1394.3
- Details about IEEE 1394
- Common IEEE 1394 cables and connectors
  - 6-pin connector
  - 4-pin connector

Students will learn how to:

- Configure peripheral devices to a Firewire port.

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - I/O interfaces
    - IEEE 1394 / Firewire

### Lecture Focus Questions:

- What are the additional functions of a six-wire IEEE 1394 over a four-wire IEEE 1394 cable?
- What is the maximum cable length of an IEEE 1394 cable?
- What are common devices that use IEEE 1394?

### Time

About 15 minutes

### Lab/Activity

- Connect Firewire Devices

## **Number of Exam Questions**

4 questions

## Section 4.4: Input Devices

### Summary

This section discusses selecting and connecting input devices. Concepts covered include:

- Common interfaces used for connecting input devices.
- Considerations for selecting the following input devices:
  - Keyboard
  - Mouse
  - Touchscreen
  - Barcode reader
  - KVM switch

Students will learn how to:

- Select input devices based on customer requirements.
- Connect input devices using the appropriate port.

### A+ Essentials Objectives:

- 1.8 Install and configure peripherals and input devices
  - Mouse
  - Keyboard
  - Bar code reader
  - Touch screen
  - KVM switch

### Lecture Focus Questions:

- What interfaces are commonly used to connect input devices on a system?
- What are the advantages of using a laser mouse over one with a roller ball?
- What are the types of touch screens? How are they different?
- For what other purposes are barcodes used other than checkout stands in retail stores?
- How does a KVM switch allow multiple computers to connect to a single set of input/output devices?

### Time

About 20 minutes

### Lab/Activity

- Connect a KVM Switch

## **Number of Exam Questions**

3 questions

## Section 4.5: Display Devices

### Summary

This section discusses details about monitors and video interfaces. Concepts covered include:

- Considerations when choosing a CRT monitor:
  - Screen size
  - Resolution
  - Display type
  - Dot pitch
  - Refresh rate
  - Interlacing
  - Additional features
- Characteristics of LCD monitors:
  - Display characteristics
  - Display types
  - Backlight method
  - Aspect ratio
  - Resolution
  - HDTV support
  - Screen size
  - Dead pixels
- Types of video interfaces:
  - D-sub
  - DVI-A
  - DVI-D
  - DVI-I
  - DMS-59
  - Composite video
  - S-video
  - HDTV (component)
  - HDMI
  - DisplayPort
  - Cable TV (F-type)

Students will learn how to:

- Identify digital and analog connectors by sight.
- Select the appropriate monitor based on customer requirements and system support.
- Configure display properties in Windows including dual monitor support.

## A+ Essentials Objectives:

- 1.7 Distinguish between the different display devices and their characteristics
  - Projectors, CRT and LCD
  - LCD technologies
    - Resolution (e.g. XGA, SXGA+, UXGA, WUXGA)
    - Contrast ratio
    - Native resolution
  - Connector types
    - VGA
    - HDMi
    - S-Video
    - Component / RGB
    - DVI pin compatibility
  - Settings
    - Refresh rate
    - Resolution
    - Multi-monitor
    - Degauss

## Lecture Focus Questions:

- What feature of a non-interlaced monitor makes it a better quality than an interlaced monitor?
- Which LCD display type typically has the fastest response time? What uses make a monitor with a slow response time a poor choice?
- Which LCD display type has the best color representation and viewing angle?
- What are two methods used for the backlight in LCD monitors?
- Which aspect ratio is used by high definition movies and television?
- What is the difference between 720p, 1080p, and 1080i? Which would you choose for full HDTV support?
- How can you tell the difference between a DVI-A and a DVI-D cable?
- Which connectors are used for an analog video signal? Which connectors provide only a digital signal?
- What are the advantages of dual link cables over single link cables?
- What is the difference between *composite* and *component* video?
- When might you see an F-type connector on a video card?

## Time

About 80 minutes

## Lab/Activity

- Connect Monitors
- Install a CRT Monitor

- Choose and Configure a Monitor
- Install an HDTV Monitor
- Configure Dual Monitors

### **Number of Exam Questions**

13 questions

## Section 4.6: Sound Devices

### Summary

This section explores concepts about using sound devices to manage the input and output of sound on computer systems. Details covered include:

- Considerations when purchasing a sound card:
  - Bus support
  - Channels
  - Sampling rate
  - Feature support
  - Analog input and output
  - Digital audio
  - Additional ports
- Common file types for sound card drivers and digital audio:
  - WAV
  - AIFF
  - AU
  - MP3
  - AAC
  - RA
  - WMA\MIDI
- Sound card connectors:
  - Mini TRS
  - Toslink
  - RCA
  - DB-15
  - Firewire
  - HDMI

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - I/O interfaces
    - Sound
- 1.8 Install and configure peripherals and input devices
  - Multimedia (e.g. MIDI, microphones)
- 1.9 Summarize the function and types of adapter cards
  - Multimedia
    - Sound card

**Lecture Focus Questions:**

- Which components are used to convert analog sound into digital data, and digital data into analog sound?
- What is the difference between 2.0 (stereo), 5.1, and 7.1 audio?
- What is a sampling rate?
- What is the difference between a WAV file and a MIDI file?
- What two connectors might be used with S/PDIF?
- What is a DB-15 connector on a sound card used for?

**Time**

About 30 minutes

**Number of Exam Questions**

4 questions

## Section 4.7: Device Installation

### Summary

This section examines guidelines and considerations to take into account when installing devices. Concepts covered include:

- Factors related to installing hardware devices:
  - System resources
  - Plug and Play (PnP)
  - Driver
  - Hot swapping/plugging
- Guidelines for installing devices
- Using Device Manager to view installed devices and their status.

Students will learn how 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 XP.
- Update device drivers.

### A+ Essentials Objectives:

- 1.1 Categorize storage devices and backup media
  - Removable storage
    - Hot swappable devices and non-hot swappable devices
- 3.3 Explain the process and steps to install and configure the Windows OS
  - Verification of hardware compatibility and minimum requirements
  - Device Manager
    - Verify
    - Install and update devices drivers
    - Driver signing
  - Demonstrate safe removal of peripherals

### Lecture Focus Questions:

- What type of hardware devices use DMA channels to communicate directly with RAM?
- When is manual configuration of a device necessary?
- What system rights are required to install devices?
- What is the role 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?
- Why is it good practice to check the manufacturer's Web site for an updated driver, rather than using the driver included on the installation disk?

**Time**

About 50 minutes

**Lab/Activity**

- Manage Devices

**Number of Exam Questions**

13 questions

## Section 5.1: Storage Devices

### Summary

This section provides an overview of storage devices. Concepts covered include:

- Common storage devices:
  - Floppy disk
  - Hard disk
  - Optical discs
  - Flash devices
  - Solid state drives
  - Tape drives
- Common storage device interfaces:
  - Parallel ATA (PATA)
  - Serial ATA (SATA)
  - Small Computer System Interface (SCSI)
  - USB/Firewire

### A+ Essentials Objectives:

- 1.1 Categorize storage devices and backup media
  - FDD
  - HDD
    - Solid state vs. magnetic
  - Removable storage
    - Tape drive
    - Solid state (e.g. thumb drive, flash, SD cards, USB)
    - External CD-RW and hard drive
- 1.2 Explain motherboard components, types and features
  - PATA
    - IDE
    - EIDE
  - SATA, eSATA
- 1.9 Summarize the function and types of adapter cards
  - I/O
    - SCSI
    - USB

### 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 floppy disk or a hard disk?
- How does SATA improve upon the limitations of PATA?

- What is a typical application for SCSI devices?
- Which storage device types are magnetic media? Which are optical? Solid state?
- Which type of interface would you commonly use to attach a flash card reader to the computer?

**Time**

About 45 minutes

**Number of Exam Questions**

11 questions

## Section 5.2: Optical Media

### Summary

This section provides an overview of selecting and using optical media. Concepts covered include:

- Types of Compact disc (CD) formats
- Digital Video Disc (DVD) basics
- Blu-ray Disc (BD) basics
- Factors to consider when selecting an optical drive:
  - Interface
  - Drive function
  - Speed
  - Format
  - Loading type
  - Cache
  - Additional Features
- Fundamentals when working with optical drives.
- Precautions to protect discs.

### A+ Essentials Objectives:

- 1.1 Categorize storage devices and backup media
  - Optical drives
    - CD / DVD / RW / Blu-Ray
  - Removable storage
    - External CD-RW

### Lecture Focus Questions:

- How much data does a CD typically hold? DVD? Blu-ray disc?
- What does the book color of the compact disc formats identify?
- What is the difference between DVD-R and DVD+R?
- 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 drives compare in speed and the amount of data that can be transferred?
- What is the difference between *dual layer* and *dual sided* discs?
- How are Blu-ray drives made compatible with both Blu-ray and CD/DVD discs?
- What is the difference between BD-R and BD-RE discs?

### Time

About 40 minutes

## **Number of Exam Questions**

5 questions

## Section 5.3: File System

### Summary

This section provides the basic information about using a file system to organize and store data. Concepts covered include:

- The main components of a file system:
  - Partition
  - Volume
  - Directory
  - File
- The characteristics of the file systems supported in Windows systems:
  - FAT32
  - NTFS
- Facts about formatting a partition

### A+ Essentials Objectives:

- 3.3 Explain the process and steps to install and configure the Windows OS
  - File systems
    - FAT32 vs. NTFS
  - Directory structures
  - Files
    - Extensions
    - Attributes
    - Permissions

### Lecture Focus Questions:

- What is the difference between a *partition* and a *volume*?
- How can a single physical disk be divided into multiple logical storage units?
- How can a single volume span multiple disks?
- What is the relationship between a file and a directory?
- What advantages does NTFS have over FAT32?
- When might you choose FAT32 over NTFS?
- When can't you use NTFS in Windows?

### Time

About 20 minutes

### Number of Exam Questions

4 questions

## Section 5.4: Managing Files

### Summary

This section provides an overview of the elements involved in managing files. Concepts covered include:

- What a file extension identifies
- Type of filename systems
  - Long file names
  - Unicode
- File types and their extensions
- Details about managing files
- Common NTFS attributes
  - Read only
  - Hidden
  - System
  - Archive
  - Encrypted
  - Compressed
  - Indexing
  - Permissions
- Facts about managing file attributes

Students will learn how to:

- Assign attributes to folders and files.
- Compress a drive, folder, or file.
- Edit Folder Options to show hidden or protected files, or to show compressed and encrypted files in different colors.
- Change the default application used for a file extension.

### A+ Essentials Objectives:

- 3.3 Explain the process and steps to install and configure the Windows OS
  - Directory structures
    - Create folders
    - Navigate directory structures
  - Files
    - Creation
    - Extensions
    - Attributes
    - Permissions

**Lecture Focus Questions:**

- What do file extensions indicate?
- What are common extensions for word processing documents?
- What is the difference between how .exe and .com files execute and how .bat files execute?
- How can attributes add a level of security to files and folders?
- What attributes are supported by NTFS that are not supported by FAT32?

**Time**

About 35 minutes

**Lab/Activity**

- Manage Files

**Number of Exam Questions**

7 questions

## Section 5.5: RAID

### Summary

In this section students will learn about using a RAID array to improve performance and/or provide fault tolerance. Concepts covered include:

- Common RAID levels
  - RAID 0 (striping)
  - RAID 1 (mirroring)
  - RAID 5 (striping with distributed parity)
- Managing RAID configurations and drives
- JBOD configurations

### A+ Essentials Objectives:

- 1.2 Explain motherboard components, types and features
  - Contrast RAID (levels 0, 1, 5)

### Lecture Focus Questions:

- 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?
- What is JBOD? How does it differ from RAID?

### Time

About 20 minutes

### Number of Exam Questions

4 questions

## Section 5.6: Disk Optimization

### Summary

This section examines details about hard disk optimization to improve a computer's overall performance. Concepts covered include:

- Optimize hard disk performance:
  - Upgrade the hard disk
  - Upgrade the disk interface
- Methods to clean up a disk drive:
  - Disk Cleanup
  - Disk Defragmenter
  - Check Disk

Students will learn how to:

- Perform Disk Cleanup.
- Defragment a hard disk.
- Check a hard disk for errors.

### A+ Essentials Objectives:

- 2.5 Given a scenario, integrate common preventative maintenance techniques
  - Scheduling preventative maintenance
    - Defrag
    - Scandisk
    - Check disk

### 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?

### Time

About 35 minutes

### Lab/Activity

- Perform Disk Maintenance

## **Number of Exam Questions**

5 questions

## Section 6.1: Networking Overview

### Summary

This section provides an overview of networking. Concepts covered include:

- The components that make a network
  - Computer systems
  - Transmission medium
  - Network interfaces
  - Protocols
- The purpose of networks
- The types of networks
  - Peer-to-peer
  - Client/server
- Classifying networks based on size:
  - Local Area Network (LAN)
  - Wide Area Network (WAN)

### A+ Essentials Objectives:

- 4.1 Summarize the basics of networking fundamentals, including technologies, devices and protocols
  - Bandwidth and latency
  - Basics of workgroups and domains
  - LAN / WAN

### 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?

### Time

About 30 minutes

### Number of Exam Questions

6 question

## Section 6.2: Protocols

### Summary

This section explores how protocols are used to allow computers to communicate on a network. Details discussed include:

- Common protocol suites:
  - TCP/IP
  - NetBIOS
- Protocols in the TCP/IP protocol suite:
  - HyperText Transfer Protocol (HTTP)
  - HyperText Markup Language (HTML)
  - Secure Sockets Layer (SSL)
  - HyperText Transfer Protocol over Secure Socket Layer or HTTP over SSL (HTTPS)
  - File Transfer Protocol (FTP)
  - Simple Mail Transfer Protocol (SMTP)
  - Internet Message Access Protocol (IMAP)
  - Post Office Protocol 3 (POP3)
  - Remote Terminal Emulation (Telnet)
  - Secure Shell (SSH)
  - Domain Name System (DNS)

### A+ Essentials Objectives:

- 4.1 Summarize the basics of networking fundamentals, including technologies, devices and protocols
  - Protocols (TCP/IP, NETBIOS)

### Lecture Focus Questions:

- What is the difference between a *protocol* and a *protocol suite*?
- What is the most common protocol suite used by computers today? Why?
- What are three e-mail protocols? How are they different?
- How can you tell if your browser is using SSL?
- How is FTP different from HTTP? When would you use FTP over HTTP?
- What is a secure alternative to Telnet?

### Time

About 15 minutes

### Number of Exam Questions

9 questions

## Section 6.3: Addressing

### Summary

In this section students will learn the basics of how network devices use addresses to identify other devices. Concepts covered include:

- The role of MAC addresses
- The role of logical addresses
  - Network
  - Host
- The role of IP addresses

### A+ Essentials Objectives:

- 4.1 Summarize the basics of networking fundamentals, including technologies, devices and protocols
  - Basics of configuring IP addressing and TCP/IP properties (DHCP, DNS)
  - Basics class identification

### 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 node 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?

### Time

About 35 minutes

### Number of Exam Questions

8 questions

## Section 6.4: Network Configuration

### Summary

This section provides an overview of network configurations. Concepts covered include:

- Hardware devices used on a network:
  - Media
  - Network adapter
  - Hub
  - Switch
  - Router
  - Bridge
- Networking standards:
  - Ethernet
  - Wireless
  - Dialup
  - Digital Subscriber Line (DSL)
  - Cable
  - Cellular
  - Satellite

### A+ Essentials Objectives:

- 4.1 Summarize the basics of networking fundamentals, including technologies, devices and protocols
  - Full-duplex, half-duplex
  - Hub, switch and router
- 4.3 Compare and contrast the different network types
  - Broadband
    - DSL
    - Cable
    - Satellite
  - Dial-up
  - Wireless
  - Cellular

### Lecture Focus Questions:

- What is the transmission medium for wireless networks?
- What is the difference between half-duplex mode and a full-duplex mode?
- What are the main differences between a hub and a switch? What makes a switch a better choice for many networks?
- Which device would you use to connect two network segments with different subnet addresses?

- What type of device connects hosts using different transmission media on the same subnet?
- What letters are used in Ethernet standards to identify copper cables?
- Which networking types are most readily available in every part of the country?
- How does DSL provide support for both analog and digital data on the same telephone line?

**Time**

About 25 minutes

**Number of Exam Questions**

15 questions

## Section 6.5: Networking Media

### Summary

This section discusses the following networking media:

- Coaxial cables:
  - Components that make up a coaxial cable
  - Advantages and disadvantages
  - Grades of coaxial cable
  - Connectors used with coaxial cable
- Twisted pair cables:
  - Components that make up twisted pair cabling
  - Advantages and disadvantages
  - Grades of unshielded twisted pair (UTP) cable types
  - Connectors used with twisted pair cables
- Fiber Optic cabling:
  - Components that make up a fiber optic cable
  - Advantages and disadvantages
  - Types of multi-mode and single mode fiber cables
  - Connector types for fiber optic cabling

Students will learn how to:

- Select the appropriate network card, cable, and connector type for a given network.
- Install a network card.

### A+ Essentials Objectives:

- 4.2 Categorize network cables and connectors and their implementations
  - Cables
    - Plenum / PVC
    - UTP (e.g. CAT3, CAT5 / 5e, CAT6)
    - STP
    - Fiber
    - Coaxial cable
  - Connectors
    - RJ45
    - RJ11

### Lecture Focus Questions:

- What are the advantages of using coaxial cable? Disadvantages?
- Which coaxial cable grade is usually used with cable and satellite TV?

- Why are wires twisted together in twisted pair cables?
- What is the difference between STP and UTP cabling?
- What is the difference between Cat3 and Cat5 cable?
- 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 to implementing fiber optic cables?
- What is the difference between single mode and multi-mode cables?
- How can you tell the difference between an ST and an SC connector?

**Time**

About 35 minutes

**Lab/Activity**

- Connect to an Ethernet Network

**Number of Exam Questions**

10 questions

## Section 6.6: IP Configuration

### Summary

This section explores configuration settings required to connect to a TCP/IP network. Concepts covered include:

- Required parameters:
  - IP address
  - Subnet mask
  - Default gateway
  - DNS server
  - Host name
- Tools to manage network connections and network configuration

Students will learn how to:

- View the status of network connections.
- Configure basic IP configuration values necessary to connect to the Internet.

### A+ Essentials Objectives:

- 3.2 Given a scenario, demonstrate proper use of user interfaces
  - My Network Places
- 4.1 Summarize the basics of networking fundamentals, including technologies, devices and protocols
  - Basics of configuring IP addressing and TCP/IP properties (DHCP, DNS)

### 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?

### Time

About 40 minutes

### Lab/Activity

- Configure TCP/IP Settings

- Create a Dialup Internet Connection

**Number of Exam Questions**

5 questions

## Section 6.7: 802.11 Wireless

### Summary

In this section students will learn the basics of wireless networks. Concepts covered include:

- Wireless networking architecture:
  - Devices
  - Connection methods
  - SSID (Service Set Identifier)
- IEEE standards
  - 802.11a
  - 802.11b
  - 802.11g
  - 802.11n
- 802.11n technologies to improve speed or distance
  - Multiple Input Multiple Output (MIMO)
  - Channel bonding
- Details about wireless networks
- Authentication methods for wireless networks
  - Open
  - Shared key
  - 802.1x
- Standards to provide security for wireless networking:
  - Wired Equivalent Privacy (WEP)
  - Wi-Fi Protected Access (WPA)
  - Wi-Fi Protected Access 2 (WPA2) or 802.11i
- Methods to limit access:
  - Change the administrator account name and password
  - Change SSID from defaults
  - Enable MAC address filtering
  - Disable DHCP

Students will learn how to:

- Configure a wireless connection.

### A+ Essentials Objectives:

- 4.3 Compare and contrast the different network types
  - Wireless
    - All 802.11 types
    - WEP
    - WPA

- SSID
  - MAC filtering
  - DHCP settings
- 5.2 Summarize the following security features
  - Wireless encryption
    - WEPx and WPAX
    - Client configuration (SSID)

### **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 802.11a?
- Two access points are part of the same wireless network. Should they use the same or a different channel? Why?
- How does MIMO differ from channel bonding?
- Why can some 802.11g devices claim to support up to 108 Mbps when the standard has a limit of 54 Mbps?
- What happens to the speed of a wireless connection as you move away from the access point?
- You are using WEP for a small home network. Which authentication type should you use?
- Why should default security settings be changed when dealing with wireless networking?

### **Time**

About 60 minutes

### **Lab/Activity**

- Connect to a Wireless Network
- Configure a Wireless Profile

### **Number of Exam Questions**

13 questions

## Section 6.8: Infrared and Bluetooth

### Summary

This section examines two additional wireless communication methods that can be used:

- Infrared (IrDA)
- Bluetooth
  - Common applications for Bluetooth include:
    - Connecting peripheral devices
    - Wireless headphones and headsets
    - Device-to-device connections

Students will learn how to:

- Configure a Windows device to be discoverable for Bluetooth connections.
- Create a pairing between two Bluetooth devices.
- Configure synchronization and service settings for Bluetooth devices.

### A+ Essentials Objectives:

- 1.10 Install, configure and optimize laptop components and features
  - Communication connections
    - Bluetooth
    - Infrared
- 4.3 Compare and contrast the different network types
  - Bluetooth

### Lecture Focus Questions:

- What are typical infrared devices and applications?
- What advantages does Bluetooth offer over infrared?
- Which types of devices typically use Bluetooth wireless?
- How does Bluetooth avoid interference with other Bluetooth devices in the area?
- Of the three classes that Bluetooth devices are classified to, which transmits the farthest? Which is the most common class used by devices?

### Time

About 20 minutes

### Number of Exam Questions

8 questions

## Section 6.9: Network Troubleshooting

### Summary

This section provides the following guidelines for troubleshooting network connections:

- Verify the network adapter.
- Verify physical connectivity.
- Verify the TCP/IP configuration.
- Verify network connectivity.

Students will learn how to:

- View the status of a network connection.
- Use **ping** and **ipconfig** to troubleshoot network connectivity problems.

### A+ Essentials Objectives:

- 3.2 Given a scenario, demonstrate proper use of user interfaces
  - Command prompt utilities
    - ping
    - ipconfig
- 4.1 Summarize the basics of networking fundamentals, including technologies, devices and protocols
  - Status indicators

### 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?

### Time

About 25 minutes

### Lab/Activity

- Fix a Network Connection

**Number of Exam Questions**

4 questions

## Section 7.1: Printers

### Summary

This section discusses facts concerning selecting and installing printers. Concepts covered include:

- Types of printers:
  - Dot matrix
  - Ink jet (ink dispersion)
  - Laser
  - Dye sublimation (dye diffusion thermal photo)
  - Solid ink
  - Thermal
- Types of printer connections:
  - Parallel
  - Serial
  - USB, IEEE 1394
  - Infrared/Wireless
  - SCSI
  - Network
- Factors to consider when purchasing a printer:
  - Connection interface
  - Print quality
  - Print speed
  - Memory
  - Additional features

Students will learn how to:

- Choose a printer to fulfill the requirements for a given situation.
- Install printers using the correct cabling, connectors, and ports.

### A+ Essentials Objectives:

- 1.11 Install and configure printers
  - Differentiate between printer types
    - Laser
    - Inkjet
    - Thermal
    - Impact

**Lecture Focus Questions:**

- Which printer type is ideal for printing carbon-copy documents?
- What is a common application for a thermal printer?
- What features are used to describe the quality and speed of print jobs a printer can produce?
- Why does a laser printer use heat in the printing process?
- What are the two most common printer interfaces?
- How can memory improve the performance of your printer?

**Time**

About 50 minutes

**Lab/Activity**

- Choose a Printer

**Number of Exam Questions**

11 questions

## Section 7.2: Printer Configuration

### Summary

This section examines installing and configuring printers. Concepts covered include:

- Printer configuration terms:
  - Print device
  - Print driver
  - Printer
  - Print queue
  - Printer port
- Process to print a file
- Printer languages
  - Escape Codes
  - Printer Control Language (PCL)
  - PostScript
- Steps to configure a printer

Students will learn how to:

- Install a Plug and Play printer.
- Manually configure a parallel or serial printer.
- Set and change the default printer.

### A+ Essentials Objectives:

- 1.11 Install and configure printers
  - Local vs. network printers
  - Consumables
- 2.3 Given a scenario, determine the troubleshooting methods and tools for printers
  - Printer properties and settings
  - Print a test page

### Lecture Focus Questions:

- What is the function of the print driver? The print queue?
- Which printing component takes the print job from the queue and sends it to the print device?
- What are three common printer languages that printers commonly understand?

### Time

About 25 minutes

## **Lab/Activity**

- Select and Install a Printer

## **Number of Exam Questions**

3 questions

## Section 7.3: Network Printing

### Summary

This section discusses the basics of configuring network printing. Details include:

- Components of network printing:
  - Spooling
  - Print queue
  - Print server
- Considerations when configuring network printing:
  - Connect the printer to the network
  - Use a print server
  - Install the printer drivers
- Steps to configure a printer attached to a Windows computer as a network printer

Students will learn how to:

- Share a local printer as a network printer.
- On a workstation, configure a printer pointing to a network print device.

### A+ Essentials Objectives:

- 1.11 Install and configure printers
  - Local vs. network printers
  - Printer drivers (compatibility)

### Lecture Focus Questions:

- What is the benefit of network printing?
- When sharing a printer, why might you need to load additional drivers for the printer?
- Which type of devices 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?

### Time

About 30 minutes

### Lab/Activity

- Configure Network Printing

## **Number of Exam Questions**

3 questions

## Section 7.4: Printing Management

### Summary

In this section students will explore managing printing on a Windows system. Details include:

- Printing components
  - Printer properties
  - Print queue
  - Print server
  - Print spooling service
- Troubleshooting
- Check the most obvious first
- Check for driver issues
- Assess print quality problems
- Evaluate common mechanical problems

Students will learn how to:

- Modify printer properties including printer name, location, availability, and driver.
- Configure printer permissions.
- Manage print server properties.
- Start and stop the Print Spooler service.

### A+ Essentials Objectives:

- 1.11 Install and configure printers
  - Printer drivers (compatibility)
  - Consumables
- 2.2 Given a scenario, explain and interpret common hardware and operating system symptoms and their causes
  - OS related symptoms
    - Windows specific printing problems
      - Print spool stalled
      - Incorrect / incompatible driver
- 2.3 Given a scenario, determine the troubleshooting methods and tools for printers
  - Manage print jobs
  - Print spooler
  - Printer properties and settings
  - Print a test page

### **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?
- 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 print jobs print using garbled text?
- How does paper quality affect a printer?

### **Time**

About 40 minutes

### **Lab/Activity**

- Configure Printer Properties
- Troubleshoot Printing

### **Number of Exam Questions**

15 questions

## Section 8.1: Portable Devices

### Summary

This section provides an overview of portable devices. Concepts covered include:

- How notebooks and other portable devices differ from desktop systems.
- Classifications for portable devices:
  - Notebook (or laptop)
  - Tablet PC
  - PDA (Personal Digital Assistant)
  - Smart phone
  - Netbook
- Components in a notebook system:
  - Processor
  - Memory
  - Keyboard
  - Pointing devices
  - Video
  - Networking
  - Internal hard disks
  - Docking station
  - Additional devices
- The role of PC cards
- Types of PC Cards
  - Type I
  - Type II
  - Type III
- PCI Express or ExpressCard standard
- Ways notebook systems save power
- Types of batteries that may be used in portable devices:
  - Nickel Cadmium (Ni-Cad)
  - Nickel Metal Hydride (NiMH)
  - Lithium Ion (Li-Ion)
  - Fuel Cell

Students will learn how to:

- Identify notebook external components.
- Add peripheral devices to notebook computers using US, PCMCIA, and ExpressCard slots.

## A+ Essentials Objectives:

- 1.10 Install, configure and optimize laptop components and features
  - Expansion devices
    - PCMCIA cards
    - PCI Express cards
    - Docking station
  - Communication connections
    - Bluetooth
    - Infrared
    - Cellular WAN
    - Ethernet
    - Modem
  - Power and electrical input devices
    - Auto-switching
    - Fixed input power supplies
    - Batteries
  - Input devices
    - Stylus / digitizer
    - Function keys
    - Point devices (e.g. touch pad, point stick / track point)

## Lecture Focus Questions:

- Why do processors for laptop computers not require the large heat sink and fan combinations that are used in PCs to dissipate heat?
- What types of devices do notebooks use instead of a mouse?
- How do you transfer data from a PDA to a desktop computer?
- 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 portable device?
- What is the battery memory effect that is present in Ni-cad batteries?
- What advantages do NiMH batteries have over Li-Ion batteries?
- How should you dispose of notebook batteries?

## Time

About 45 minutes

## Number of Exam Questions

12 questions

## Section 8.2: Power Management

### Summary

This section examines configuring power management. Concepts covered include:

- Advanced Configuration and Power Interface (ACPI) standards
- ACPI power states:
  - On
  - Enabled
  - Standby
  - Suspend
  - Hibernate
- The role of Power Schemes to manage power for the system
- Issues involved with power settings

Students will learn how to:

- Change the current power scheme used by a computer.
- Create, modify, and save power schemes.

### A+ Essentials Objectives:

- 3.3 Explain the process and steps to install and configure the Windows OS
  - Configure power management
    - Suspend
    - Wake on LAN
    - Sleep timers
    - Hibernate
    - Standby

### Lecture Focus Questions:

- What is the difference between *standby* and *suspend*?
- What devices are controlled through Windows Power Schemes?
- What is the purpose of the WoL feature?

### Time

About 35 minutes

### Lab/Activity

- Edit Power Options
- Create a Power Plan

## **Number of Exam Questions**

4 questions

## Section 8.3: Troubleshooting

### Summary

In this section students will learn about troubleshooting portable devices. Concepts covered include:

- Guidelines for troubleshooting the following notebook components:
  - Power
  - Video
  - Portable components
- Precautions when working with portable devices

### A+ Essentials Objectives:

- 2.4 Given a scenario, explain and interpret common laptop issues and determine the appropriate basic troubleshooting method
  - Issues
    - Power conditions
    - Video
    - Keyboard
    - Pointer
    - Stylus
    - Wireless card issues
  - Methods
    - Verify power (e.g. LEDs, swap AC adapter)
    - Remove unneeded peripherals
    - Plug in external monitor
    - Toggle Fn keys or hardware switches
    - Check LCD cutoff switch
    - Verify backlight functionality and pixilation
    - Check switch for built-in WIFI antennas or external antennas

### Lecture Focus Questions:

- The LCD screen on your laptop doesn't work, but a monitor connected to the external video port does work. What component has the problem?
- What can you do as a temporary solution if the mouse or keyboard stops working on a laptop?
- How do most laptops allow you to type in numbers similar to the 10-key number pad on a full-sized keyboard?
- When might you need to calibrate the battery?
- What are three things you can do to help keep laptops cool?
- Why is a change in temperature potentially damaging for a laptop?

**Time**

About 45 minutes

**Number of Exam Questions**

16 questions

## Section 9.1: Software Security

### Summary

This section provides examples of malware and countermeasures to protect computers against malware. Concepts covered include:

- Common malware:
  - Virus
  - Worm
  - Trojan horse
  - Spyware
  - Adware
  - Grayware
  - Spam
- The role of anti-virus software
- Additional countermeasures for malware

Students will learn how to:

- Install malware protection software.
- Update virus definition files.

### A+ Essentials Objectives:

- 5.2 Summarize the following security features
  - Malicious software protection
    - Viruses
    - Trojans
    - Worms
    - Spam
    - Spyware
    - Adware
    - Grayware

### Lecture Focus Questions:

- What is the difference between a *virus* and a *worm*?
- How are most viruses transmitted? How can this be prevented?
- What is the best way to protect against Trojans?
- What is the most important thing to remember when trying to prevent spam?
- How is *adware* different from *spyware*?
- Why are virus definition files important? Why should they be kept up-to-date?

**Time**

About 20 minutes

**Number of Exam Questions**

11 questions

## **Section 9.2: Social Engineering**

### **Summary**

In this section students will learn how social engineering exploits human nature to convince someone to perform an activity. Concepts discussed include:

- Examples of social engineering
- Social engineering attacks:
  - Dumpster diving
  - Shoulder surfing
  - Masquerading
  - Eavesdropping
  - Phishing
- Countermeasures to social engineering

### **A+ Essentials Objectives:**

- 5.1 Explain the basic principles of security concepts and technologies
  - Basics of data sensitivity and data security
    - Social engineering

### **Lecture Focus Questions:**

- What characteristics of human nature does social engineering exploit?
- Who is usually the target in social engineering?
- How can dumpster diving give attackers valuable information?
- What is the best defense against a social engineering attack?

### **Time**

About 15 minutes

### **Number of Exam Questions**

4 questions

## Section 9.3: Authentication

### Summary

This section discusses using authentication to validate a user's identity. Topics covered include:

- Authentication credentials
  - Password
  - Smart card
  - Biometric
- Password weaknesses
- Strong password policy
- Control passwords with policy settings:
- Password Policy settings:
  - Minimum password length
  - Password complexity
  - Maximum password age
  - Minimum password age
  - Enforce password history
- Account Lockout Policy settings:
  - Account lockout threshold
  - Account lockout duration
  - Reset account lockout counter after

Students will learn how to:

- Configure Password Policy and Account Lockout settings in the local security policy.
- Use a biometric scanner to enroll (record) fingerprints that can be used for authentication.
- Configure fingerprint settings to automate execution of an application.

### A+ Essentials Objectives:

- 1.8 Install and configure peripherals and input devices
  - Biometric devices
- 5.1 Explain the basic principles of security concepts and technologies
  - Authentication technologies
    - User name
    - Password
    - Biometrics
    - Smart cards
- 5.2 Summarize the following security features

- Password management / password complexity
- Biometrics
  - Fingerprint scanner

**Lecture Focus Questions:**

- What is the difference between a *password* and a *passphrase*?
- How is cognitive information typically used in an authentication system?
- What additional information is typically required when authenticating with a smart card?
- What type of credentials do biometric systems use for authentication? What are four examples of biometric credentials?
- What tendency of human nature makes many passwords easier to crack?
- What are the characteristics of a strong password policy?
- What is the difference between password policy settings and account lockout settings?

**Time**

About 30 minutes

**Lab/Activity**

- Enforce Password Settings

**Number of Exam Questions**

10 questions

## Section 9.4: BIOS Security

### Summary

In this section students will learn the basics of BIOS security. Concepts covered include:

- Security-related features in the BIOS
  - BIOS passwords
  - Chassis intrusion detection
  - Hard disk password
  - Trusted Platform Module (TPM)

Students will learn how to:

- Configure BIOS and hard disk passwords.
- Enable and reset chassis intrusion detection.
- Initialize a TPM.

### A+ Essentials Objectives:

- 5.2 Summarize the following security features
  - BIOS Security
    - Drive lock
    - Passwords
    - Intrusion detection
    - TPM

### Lecture Focus Questions:

- What is the difference between a user and an administrator password in the BIOS?
- Why do BIOS passwords offer little system protection?
- How does chassis intrusion detection help to secure the BIOS?
- How does a hard disk password differ from a BIOS 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?

### Time

About 25 minutes

### Lab/Activity

- Configure BIOS Security

## **Number of Exam Questions**

7 questions

## Section 9.5: Encryption

### Summary

This section discusses using encryption to secure data by obscuring it from those who do not have the required key to access the data. Details about the following are presented:

- Types of encryption:
  - File encryption
  - Disk encryption
  - Data encryption

Students will learn how to:

- Encrypt files and add authorized users.

### A+ Essentials Objectives:

- 4.1 Summarize the basics of networking fundamentals, including technologies, devices and protocols
  - Common ports: HTTPS
  - Identify Virtual Private Networks (VPN)
- 5.1 Explain the basic principles of security concepts and technologies
  - Encryption technologies
- 5.2 Summarize the following security features
  - Wireless encryption
    - WEPx and WPAx

### Lecture Focus Questions:

- Which encryption method encrypts individual files so that only the owner and other users who have been authorized 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?
- 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?

### Time

About 25 minutes

## **Lab/Activity**

- Encrypt Files

## **Number of Exam Questions**

10 questions

## Section 9.6: Physical Security

### Summary

This section discusses the following methods of physically securing computer systems:

- Building security
- Hardware locks
- Lock the workstation
- Computer tracking service
- Removable storage
- Storage media disposal

Students will learn how to:

- Wipe data from a hard disk prior to disposal.
- Configure a screen saver and require a password to lock the Windows desktop.

### A+ Essentials Objectives:

- 5.1 Explain the basic principles of security concepts and technologies
  - Data wiping / hard drive destruction / hard drive recycling
  - Basics of data sensitivity and data security
    - Compliance
    - Classifications
- 5.2 Summarize the following security features
  - BIOS Security
    - Drive lock
    - TPM

### 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 is the difference between a user password and an administrator password set in the BIOS?
- What is the difference of securely disposing of magnetic media and securely disposing of optical media?

### Time

About 25 minutes

## **Lab/Activity**

- Require a Screen Saver Password

## **Number of Exam Questions**

5 questions

## Section 9.7: Firewalls

### Summary

This section discusses using firewalls to inspect network traffic and allow or block traffic based on a set of rules. Concepts covered include:

- Types of firewalls:
  - Network-based firewall
  - Host-based firewall
- Filtering rules use characteristics of the traffic to identify allowed and blocked traffic.
- Port numbers for common network protocols

Students will learn how to:

- Enable the Windows firewall.
- Open and close ports in the Windows firewall.

### A+ Essentials Objectives:

- 4.1 Summarize the basics of networking fundamentals, including technologies, devices and protocols
  - Common ports: HTTP, FTP, POP, SMTP, TELNET, HTTPS
- 5.1 Explain the basic principles of security concepts and technologies
  - Software firewall
    - Port security
    - Exceptions

### Lecture Focus Questions:

- Why is using a firewall important when connecting your computer to the Internet?
- What is the difference between a *network-based* firewall and a *host-based* firewall? Is the Windows firewall service a host-based or a network-based firewall solution?
- What information does the firewall use to make filtering decisions when allowing or blocking communications?
- What are the disadvantages to using a firewall?

### Time

About 25 minutes

### Lab/Activity

- Configure the Windows Firewall

## **Number of Exam Questions**

9 questions

## Section 10.1: Applications

### Summary

This section discusses installing and managing applications. Concepts covered include:

- Elements an installation typically modifies
- Shortcuts
- Applications a 64-bit operating system can run
- Default directories that applications are installed to
- Permissions required to install applications
- Special rights required to run applications
- Solutions when you are unable to run an application

Students will learn how to:

- Run an application as an administrator.
- Configure compatibility mode for an application.

### A+ Essentials Objectives:

- 2.2 Given a scenario, explain and interpret common hardware and operating system symptoms and their causes
  - OS related symptoms
    - Bluescreen
    - System lock-up
    - Input/output device
    - Application install
- 3.1 Compare and contrast the different Windows Operating Systems and their features
  - Windows 2000, Windows XP 32bit vs. 64bit, Windows Vista 32 bit vs. 64bit
    - Side bar, Aero, UAC, minimum system requirements, system limits
    - Windows 2000 and newer - upgrade paths and requirements
    - Terminology (32bit vs. 64bit - x86 vs. x64)
    - Application compatibility, installed program locations (32bit vs. 64bit), Windows compatibility mode

### Lecture Focus Questions:

- How is a shortcut different than a regular file?
- What is the difference between the **Program Files** and the **Program Files (x86)** folders? Which operating systems have the **Program Files (x86)** folder?

- On Windows XP, what group membership might be required to run legacy applications?

**Time**

About 20 minutes

**Number of Exam Questions**

4 questions

## Section 10.2: Updates

### Summary

This section explores concepts about Windows updates. Concepts covered include:

- The role of updates
- Types of Windows updates:
  - Hotfix
  - Service pack (SP)
- The role of the Windows Update feature
- Updating non-Microsoft applications
- Updating hardware devices

Students will learn how to:

- Enable and configure automatic Windows Updates.
- Update the firmware on a network device.

### A+ Essentials Objectives:

- 2.5 Given a scenario, integrate common preventative maintenance techniques
  - Updates
    - Driver
    - Firmware
    - OS
    - Security

### Lecture Focus Questions:

- What is the difference between a *hotfix* and a *service pack*?
- What should you do if you need to install service pack 2 but haven't yet installed service pack 1?
- 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 the list of 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?

### Time

About 40 minutes

## **Lab/Activity**

- Configure Windows Update

## **Number of Exam Questions**

7 questions

## Section 10.3: System Protection

### Summary

This section examines protecting a system through backups. Concepts covered include:

- Types of data that backups distinguish:
  - System state data
  - User data
  - Application data
- Tools to protect Windows 2000 and XP systems:
  - Windows Backup (Ntbackup)
  - Automated System Recovery (ASR)
- Tools to protect Windows Vista systems:
  - Automatic Backups
  - Complete PC Backup and Restore
- Additional tools:
  - System Restore
  - Previous Versions
- Recommendations for backing up, scheduling, and storing backup media

Students will learn how to:

- Back up data using Ntbackup.
- Create a Complete PC Backup in Windows Vista.
- Schedule automatic backups of user data in Windows Vista.
- Protect your system with Restore Points.

### A+ Essentials Objectives:

- 2.5 Given a scenario, integrate common preventative maintenance techniques
  - Backup procedures
- 3.4 Explain the basics of boot sequences, methods and startup utilities
  - Boot options
    - Recovery options
      - Automated System Recovery (ASR)
      - Emergency Repair Disk (ERD)

### Lecture Focus Questions:

- What type of data is backed up with a system state backup?
- Which tools would you use to back up user data on Windows XP? On Windows Vista?
- How does Complete PC Backup and Restore with Windows Vista differ from Automated System Recovery (ASR) with Windows XP?

- What types of backup media can Ntbackup use? How does this differ from the backup media used by Automatic Backups with Windows Vista?
- How are Previous Versions related to System Restore? Which would you use to restore user data?
- Where should backup media be stored for maximum security?
- Why should you test your restore methods?

**Time**

About 65 minutes

**Lab/Activity**

- Back Up the Computer
- Create a Restore Point

**Number of Exam Questions**

5 questions

## Section 10.4: Virtual Memory

### Summary

This section provides information about using virtual memory to allow more applications to run on the system than physical memory could support. Concepts covered include:

- The role of the Virtual Memory Manager (VMM)
- Steps VMM uses to manage applications
- Managing virtual memory:
  - Symptoms of low physical memory
  - Disk thrashing
  - The role of the System Control Panel applet
  - Recommendation for swap size
  - Increasing performance
  - Saving a memory dump

Students will learn how to:

- Check memory usage in Task Manager.
- Configure virtual memory settings.
- Create a swap file.

### A+ Essentials Objectives:

- 3.3 Explain the process and steps to install and configure the Windows OS
  - Virtual memory

### Lecture Focus Questions:

- What is the benefit of virtual memory?
- How does virtual memory work? What is the purpose of swapping?
- What is the benefit of a separate partition for the swap file?
- Is a low number of page faults a bad thing? Why?
- What condition causes disk *thrashing*? How can you reduce its effects?

### Time

About 25 minutes

### Lab/Activity

- Configure Virtual Memory

### Number of Exam Questions

6 questions

## Section 10.5: System Errors

### Summary

This section provides an overview of how to handle system errors. Concepts covered include:

- Causes of errors, lockups, and system crashes
- Blue Screen of Death (BSOD)
- Suggestions for troubleshooting a system
- Common problems and causes
- Alternate boot modes:
  - Press F8
  - Use Msconfig.exe to specify the boot mode
- Different startup modes:
  - Safe Mode
  - Safe Mode with Networking
  - Safe Mode with Command Prompt
  - Enable Boot Logging
  - Enable VGA Mode
  - Last Known Good
  - Disable automatic restart on system failure
- Recommendations to troubleshoot startup errors with advanced boot options

Students will learn how to:

- During startup, access the advanced boot menu.
- Choose advanced boot options to customize how the system starts and to correct problems.

### A+ Essentials Objectives:

- 2.2 Given a scenario, explain and interpret common hardware and operating system symptoms and their causes
  - OS related symptoms
    - Bluescreen
    - System lock-up
    - Input/output device
    - Application install
    - Start or load
  - Hardware related symptoms
    - Excessive heat
    - Noise
    - Odors
    - Status light indicators

- Alerts
  - Visible damage (e.g. cable, plastic)
- 3.4 Explain the basics of boot sequences, methods and startup utilities
  - Boot options
    - Safe mode

### **Lecture Focus Questions:**

- What are the most common types of crashes?
- What types of things should be recorded when a crash occurs? Why is this so important?
- What sources are available for reference if common troubleshooting doesn't provide an answer?
- How can driver rollback help you recover from system instability problems?
- Which type of components does Windows Reporting monitor for errors?
- When you select the startup mode of **Last Known Good** to restore the registry to the last working configuration, where does the operating system pull the configuration information from?

### **Time**

About 50 minutes

### **Number of Exam Questions**

11 questions

## Section 10.6: System Recovery

### Summary

This section discusses procedures to provide system recovery when a system will not boot or works improperly. Concepts covered include:

- Methods to try before using recovery tools
- Methods to recover the system:
  - System Restore (restore points)
  - Repair installation Startup Repair
  - Recovery Console (Repair command prompt)
  - Emergency Repair Disk (ERD)/ Automated System Recovery (ASR)/Complete PC Restore
  - Recovery disc/partition
  - Parallel installation
- Methods to recover lost data files:
  - Previous Versions
  - Restore from backup

Students will learn how to:

- Boot using the installation disc and use automatic recovery options to repair an installation.
- Restore the system to a restore point.
- Restore user data using previous versions and from backup.
- Restore a system using Complete PC Restore.

### A+ Essentials Objectives:

- 3.3 Explain the process and steps to install and configure the Windows OS
  - Installation methods
    - Recover CD
    - Factory recovery partition
  - Operating system installation options
    - Repair install
- 3.4 Explain the basics of boot sequences, methods and startup utilities
  - Boot options
    - Boot to restore point
    - Recovery options
      - Automated System Recovery (ASR)
      - Emergency Repair Disk (ERD)
      - Recovery console

### **Lecture Focus Questions:**

- Before using recovery tools, what system recovery methods should you attempt 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? To the user data files?
- What types of elements does the Startup Repair inspect and automatically repair to fix problems that keep Windows from booting?
- When should the Recovery Console be used 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? Disadvantages?
- What are the two ways that a parallel installation can be performed?
- What are the benefits of parallel installation? What are the drawbacks?
- What methods can you use to recover lost data files?

### **Time**

About 40 minutes

### **Number of Exam Questions**

8 questions

## Section 11.1: Pre-installation

### Summary

This section provides an overview of decisions that must be made prior to installation. Concepts covered include:

- When selecting an operating system consider the following:
  - Versions
    - Windows 7
    - Windows Vista
    - Windows 2000
    - Windows XP
  - Features for different versions
  - Editions
    - Home
    - Home Premium
    - Professional
    - Business
    - Ultimate
    - Enterprise
  - Advantages of using 32-bit(x86) or 64-bit (x64 or IA-64) versions
  - Hardware requirements
- When planning an installation:
  - Consider compatibility of hardware and software
  - Choose the installation method:
    - In-place upgrade
    - Clean (custom) install
  - Perform a backup of the existing system

Students will learn how to:

- Run the Upgrade Advisor to verify system compatibility when upgrading Windows.

### A+ Essentials Objectives:

- 3.1 Compare and contrast the different Windows Operating Systems and their features
  - Windows 2000, Windows XP 32bit vs. 64bit, Windows Vista 32 bit vs. 64bit
    - Side bar, Aero, UAC, minimum system requirements, system limits
    - Windows 2000 and newer - upgrade paths and requirements
- 3.3 Explain the process and steps to install and configure the Windows OS
  - Verification of hardware compatibility and minimum requirements

### **Lecture Focus Questions:**

- Which edition of Windows Vista would you choose if you need to connect to a domain and implement BitLocker?
- Which operating system version(s) and edition(s) support running Windows XP as a virtual computer?
- What are the advantages of using a 64-bit version of the operating system over a 32-bit version?
- You have purchased a new computer with an x64 processor. Which operating system versions could you install (32-bit or 64-bit)?
- What are the potential problems when moving from a 32-bit operating system to a 64-bit operating system? How does the Upgrade Advisor help to alleviate these problems?
- 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?
- You currently run the 32-bit version of Windows Vista Home Premium edition. Which type of installation media (upgrade or install) and installation method (in-place or custom) could you use to upgrade to the 64-bit version of Windows 7 Home Premium?
- You have an existing Windows XP computer that you want to upgrade to Windows 7. What tasks should you perform prior to starting the upgrade?

### **Time**

About 45 minutes

### **Number of Exam Questions**

10 questions

## Section 11.2: Installation

### Summary

In this section students will learn about methods to install a Windows operating system.

Concepts covered include:

- Steps to install Windows from the installation disc (CD or DVD)
- Alternative methods to install Windows:
  - Bootable flash drive
  - Network installation
  - Unattended
  - Disk imaging

Students will learn how to:

- Use a RAID configuration utility to create a RAID array prior to installing the operating system.
- Change the boot order of devices in the BIOS.
- Install Windows XP and Windows Vista.

### A+ Essentials Objectives:

- 3.3 Explain the process and steps to install and configure the Windows OS
  - Installation methods
    - Boot media such as CD, floppy or USB
    - Network installation
    - Install from image
  - Operating system installation options
    - File system type
    - Network configuration
  - Disk preparation order
    - Format drive
    - Partition
    - Start installation
- 3.4 Explain the basics of boot sequences, methods and startup utilities
  - Disk boot order / device priority
    - Types of boot devices (disk, network, USB, other)

### Lecture Focus Questions:

- You are getting ready to install Windows on a new system. You want to use disk mirroring to protect your system. When should you create the mirrored set?
- What SATA disk setting would you choose when defining a mirrored set?
- How would you start the installation when performing an in-place upgrade from Windows XP to Windows Vista?

- During a Windows XP installation, the hard disks where you configured your RAID array are not detected and listed as available for installation. What should you do?
- During a Windows XP installation, you select the destination disk for the install but do not configure partition and formatting information. How will Windows partition and format the disk?
- You have a new computer on which you need to install Windows Vista. The installation files are on a network share. How would you start the installation?
- What computer requirements are necessary when using disk imaging for installation?

**Time**

About 50 minutes

**Lab/Activity**

- Prepare Disks for Installation 1
- Prepare Disks for Installation 2

**Number of Exam Questions**

5 questions

## Section 11.3: Post Installation

### Summary

This section examines details about the following tasks that need to be performed following a successful installation of Windows:

- Editing the CMOS settings to boot from the hard drive first.
- Updating device drivers for unrecognized devices.
- Configuring Windows Update and downloading the latest updates.
- Activating your copy of Windows within 30 days.
- Configuring security software.
- Migrating user configuration settings and data.
- Installing applications and adding other Windows features.
- Taking a complete PC backup and scheduling regular user data backups.

Students will learn how to:

- Migrate user settings and data using the Easy Transfer wizard and USMT.

### A+ Essentials Objectives:

- 3.3 Explain the process and steps to install and configure the Windows OS
  - Device Manager
    - Verify
    - Install and update devices drivers
  - User data migration - User State Migration Tool (USMT)

### Lecture Focus Questions:

- Why should you configure Windows Update shortly after installation?
- How does product *registration* differ from *activation*? Which one is optional?
- You have installed Windows Vista on a new computer and used USMT to migrate the settings from your previous computer. What else would you need to do to configure your new computer like your old computer?
- You have a computer running Windows XP that you want to upgrade to Windows 7. You want to make sure that all of your user settings and data are present after the upgrade. Which USMT tool would you run to save your user settings? When during the installation process should you run it?
- What are two security measures you should put into place following installing Windows?

### Time

About 20 minutes

## **Number of Exam Questions**

4 questions

# Practice Exams

## Summary

This section provides information to help prepare students to take the exam and to register for the exam.

Students will also have the opportunity of testing their mastery of the concepts presented in this course to reaffirm that they are ready for the certification exam. For example, all questions that apply to **Objective 100. Hardware** are grouped together and presented in practice exam *Domain 1: Hardware, All Questions*. Students will typically take about 60-90 minutes to complete each of the following practice exams.

Domain 1: Hardware, All Questions (185 questions)

Domain 2: Troubleshooting, Repair and Maintenance, All Questions (111 questions)

Domain 3: Operating Systems and Software, All Questions (107 questions)

Domain 4: Networking, All Questions (89 questions)

Domain 5: Security, All Questions (56 questions)

Domain 6: Operational Procedure, All Questions (57 questions)

The *Certification Practice Exam* consists of 100 questions that are randomly selected from the above practice exams. Each time the Certification Practice Exam is accessed different questions may be presented. The Certification Practice Exam has a time limit of 90 minutes -- just like the real certification exam. A passing score of 95% should verify that the student has mastered the concepts and is ready to take the real certification exam.