

A+ (Computer Maintenance & Repair)

CompTIA A+ Essentials (2009 Edition) Objectives

Exam Number: 220-701

Levels:	Grades 11-12
Units of Credit	1.0
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Core Code:	35010000040
Prerequisites:	Keyboarding, Intro to IT
Skill Test:	#884 A+ (Computer Maintenance & Repair) CompTIA Strata IT Fundamentals (FC0-U41) CompTIA A+ Essentials (220-701) CompTIA A+ Practical Application (220-702)

CORE DESCRIPTION

Students will learn necessary competencies for an entry-level IT professional including installing, building, upgrading, repairing, configuring, troubleshooting, optimizing, diagnosing, and performing preventive maintenance of basic personal computer hardware and operating systems.

USOE Revision Notes: Words in italics are added from 220-702

CORE STANDARDS, OBJECTIVES, AND INDICATORS

Standard 1 Students will identify, classify, *install, configure and maintain, detect problems with, troubleshoot, repair or replace* Personal Computer hardware components.

Objective 1: Categorize, *install, configure and maintain* storage devices and backup media.

- a. Describe magnetic storage media.
- b. Contrast Solid state vs. magnetic media.
- c. Compare Optical drives CD / DVD / RW / Blu-Ray.
- d. Indicate functions of Tape drives and media.

Objective 2: Identify types and features, *install, configure and maintain* motherboard components.

- a. Recognize form factors of motherboards.
- b. Distinguish I/O interfaces - Sound, Video, USB, Serial, IEEE 1394 / Firewire, Parallel, NIC, Modem, PS/2.
- c. Differentiate memory slots types - RIMM, DIMM, SODIMM, SIMM.
- d. Identify modern processor sockets.
- e. Differentiate bus architectures.
- f. Characterize Bus slots - PCI, AGP, PCIe, AMR, CNR, PCMCIA.
- g. Recognize PATA - IDE, EIDE connectors and devices.
- h. Identify SATA, eSATA connectors and devices.
- i. Contrast RAID levels 0, 1, 5.
- j. Identify Chipsets.
- k. BIOS / CMOS / Firmware - POST, CMOS battery.
- l. Describe Riser card / daughterboard.

Objective 3: Classify types and characteristics, detect problems, troubleshoot, repair/replace power supplies

- a. Describe AC adapter.
- b. Recognize ATX proprietary.
- c. Define voltage, wattage and capacity.
- d. Identify voltage selector switch.
- e. Describe connector types - 4, 6, 20, 24 pin.

Objective 4 Explain the purpose, characteristics, and features of CPUs; install, detect problems with CPUs

- a. Differentiate CPU types - AMD, Intel.
- b. Describe hyper threading.
- c. Differentiate multi core - Dual core, Triple core, Quad core.
- d. Define onchip cache - L1, L2.
- e. Explain real speed vs. actual speed.
- f. Distinguish 32bit vs. 64 bit CPUs.

Objective 5 Identify, install and detect problems with cooling devices

- a. Recognize importance of heat sinks.
- b. Maintain CPU and case fans.
- c. Describe liquid cooling systems.
- d. Depict how and where to use thermal compound.

Objective 6 Compare and contrast memory types, install, troubleshoot memory

- a. Differentiate memory types - DRAM, SRAM, SDRAM, DDR / DDR2 / DDR3, RAMBUS.
- b. Compare Parity vs. Non-parity memory technology.
- c. Contrast ECC vs. non-ECC memory technology.
- d. Describe single sided vs. double sided memory.
- e. Characterize single channel vs. dual channel memory.
- f. Summarize speed - PC100, PC133, PC2700, PC3200, DDR3-1600, DDR2-667

Objective 7 Recognize different display devices and their characteristics, install, configure and maintain display devices

- a. Differentiate display types - projector, CRT and LCD.
- b. Describe LCD display characteristics - Resolution (e.g. XGA, SXGA+, UXGA, WUXGA), Contrast ratio, Native resolution.
- c. Recognize display connector types - VGA, HDMI, S-Video, Component / RGB, DVI pin compatibility.
- d. Configure display settings - Refresh rate, Resolution, Multi-monitor, Degauss.

Objective 8 Install, configure and troubleshoot peripherals and input devices

- a. List important mouse support issues.
- b. Outline important keyboard support issues.
- c. Describe Bar code reader.
- d. Recognize multimedia equipment (e.g. web and digital cameras, MIDI, microphones).
- e. Define biometric devices.
- f. Describe a touch screen.
- g. Characterize a KVM switch.

Objective 9 Summarize the function and types of adapter cards

- a. Recognize video adapters - PCI, PCIe, AGP.
- b. Identify and configure multimedia devices - Sound card, TV tuner cards, Capture cards.
- c. Describe I/O systems - SCSI, Serial, USB, Parallel.
- d. Define data communications - NIC, Modem.

Objective 10 Install, configure, optimize, detect problems with, troubleshoot and repair/replace laptop components and features

- a. Characterize expansion devices - PCMCIA cards, PCI Express cards, Docking station.
- b. Explain communication connections - Bluetooth, Infrared, Cellular WAN, Ethernet, Modem.
- c. Describe power and electrical input devices - Auto-switching, Fixed input power supplies, Batteries.
- d. Explain where specialized input devices are used - Stylus / digitizer, Function keys, Point devices (e.g. touch pad, point stick / track point).

Objective 11 Install, configure and troubleshoot printers

- a. Differentiate between printer types - Laser, Inkjet, Thermal, Impact.
- b. Contrast local vs. network printers.
- c. Define and explain how to install printer drivers (compatibility).
- d. Summarize consumables for printers.

STANDARD 2

Students will demonstrate Troubleshooting, Repair and Maintenance Skills.

Objective 1 Given a scenario, explain the troubleshooting theory.

- a. Identify the problem - Question the user and identify user changes to computer and perform backups before making changes
- b. Establish a theory of probable cause (question the obvious)
- c. 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
- d. Establish a plan of action to resolve the problem and implement the solution
- e. Verify full system functionality and if applicable implement preventative measures
- f. Document findings, actions and outcomes

Objective 2 Given a scenario, explain and interpret common hardware and operating system symptoms and their causes.

- a. Identify OS related symptoms - Bluescreen, System lock-up, Input/output device, Application install, Start or load, Windows specific printing problems.
- b. Recognize hardware related symptoms - Excessive heat, Noise, Odors, Status light indicators, Alerts, Visible damage (e.g. cable, plastic).
- c. Use documentation and resources - User / installation manuals, Internet / web based, Training materials.

Objective 3 Given a scenario, determine the troubleshooting methods and tools for printers.

- a. Manage print jobs.
- b. Use the Printers and Faxes spooler to troubleshoot printing issues.
- c. Manage printer properties and settings.
- d. Print a test page from the OS and from the printer.

Objective 4 Given a scenario, explain and interpret common laptop issues and determine the appropriate basic troubleshooting method.

- a. Describe ordinary issues with laptops - Power conditions, Video, Keyboard, Pointer, Stylus, Wireless card issues.
- b. Explain common methods in troubleshooting laptops - 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.

Objective 5 Given a scenario, integrate common preventative maintenance techniques.

- a. Perform a physical inspection of a PC.
- b. Obtain and install updates - Driver, Firmware, OS, Security.
- c. Schedule preventative maintenance - Defrag, Scandisk, Check disk, Startup programs.

- d. Use appropriate repair tools and cleaning materials - Compressed air, Lint free cloth, Computer vacuum and compressors.
- e. Manage appropriate power devices - Power strip, surge protector or UPS
- f. Describe how to ensure proper environment to promote preventative maintenance.
- g. Outline proper backup procedures.

STANDARD 3

Students will understand Operating Systems and Software - Unless otherwise noted, operating systems referred to within include Microsoft Windows 2000, Windows XP Professional, XP Home, XP MediaCenter, Windows Vista Home, Home Premium, Business and Ultimate.

Objective 1 Compare and contrast the different Windows Operating Systems and their features.

- a. Differentiate between 32 bit vs. 64 bit operating systems.
- b. List the differences between Windows 2000, Windows XP, Windows Vista, minimum system requirements, system limits, upgrade paths.
- c. Outline Windows compatibility mode, User interface, start bar layout.

Objective 2 Given a scenario, demonstrate proper use of user interfaces.

- a. Demonstrate how to navigate the file structure with Windows Explorer.
- b. Show proper use of My Computer to navigate the file structure.
- c. Use Control Panel to manage computer settings.
- d. Use Command prompt utilities - telnet, ping, ipconfig.
- e. Run line utilities - msconfig, msinfo32, Dxdiag, Cmd, REGEDIT, DIR, COPY, XCOPY, /?, MD, CD, RD.
- f. Navigate to network resources using My Network Places.
- g. List the functions of the Task bar / systray.
- h. Illustrate proper use of Administrative tools - Performance monitor, Event Viewer, Services, Computer Management.
- i. Demonstrate how to start Task Manager and what benefit it offers.
- j. Show how to modify the Start Menu and how it may facilitate computer use.
- k. Use *System tools - Disk Clean Up, Defrag.*

Objective 3 Explain the process and steps to install and configure the Windows OS.

- a. Differentiate file systems - FAT32 vs. NTFS.
- b. Describe directory structures - Create folders, Navigate directory structures.
- c. Define Files - Creation, Extensions, Attributes, Permissions.
- d. Demonstrate how to verify of hardware compatibility and minimum requirements.
- e. Outline installation methods - Boot media such as CD, floppy or USB, Network installation, Install from image, Recover CD, Factory recovery partition.
- f. Illustrate operating system installation options - File system type, Network configuration, Repair install.
- g. Describe disk preparation order - Format drive, Partition, Start installation.
- h. Use Device Manager - Verify , install and update devices drivers, Driver signing.
- i. Explain User data migration – User State Migration Tool (USMT).
- j. Characterize virtual memory.
- k. Configure power management - Suspend, Wake on LAN, Sleep timers, Hibernate, Standby.
- l. Demonstrate safe removal of peripherals.

Objective 4 Explain the basics of boot sequences, methods, startup utilities, and errors

- a. Illustrate how to set Disk boot order / device priority - Types of boot devices (disk, network, USB, other).
- b. Describe Boot options - Safe mode, Boot to restore point, Recovery options.
- c. *Characterize Boot errors - Invalid boot disk, Inaccessible boot drive, Missing NTLDR.*

STANDARD 4

Students will understand and use Networking concepts.

Objective 1 Summarize networking fundamentals, devices and protocols, recognize improper configurations

- a. Illustrate the basics of configuring IP addressing and TCP/IP properties (DHCP, DNS, Gateway).
- b. Explain bandwidth and latency they relate to networking.
- c. Tell how to use status indicators.
- d. Describe networking protocols (TCP/IP, NETBIOS).
- e. Contrast full-duplex, half-duplex.
- f. Compare workgroups and domains.
- g. List common port numbers: HTTP, FTP, POP, SMTP, TELNET, HTTPS.
- h. Compare and contrast LANs / WANs.
- i. Define a Hub, switch and router.
- j. Clarify the concept of Virtual Private Networks (VPN).
- k. Name basics IP address class identifications.

Objective 2 Categorize network cables and connectors and their implementations

- a. Describe network cables - Plenum / PVC, UTP (e.g. CAT3, CAT5 / 5e, CAT6), STP, Fiber, Coaxial cable.
- b. Identify network connectors - RJ45, RJ11.

Objective 3 Compare and contrast the different network types

- a. Describe common types of broadband - DSL, Cable, Satellite, Fiber.
- b. Tell where dial-up networking is appropriate.
- c. Characterize Wireless network concepts - All 802.11 types, WEP, WPA, SSID, MAC filtering, DHCP settings
- d. Explain the strengths and limitations of Bluetooth networking.
- e. Point out the benefits and drawbacks of Cellular networking.

Objective 4 Troubleshoot client-side connectivity issues using appropriate tools

- a. Troubleshoot and configure TCP/IP settings - Gateway, Subnet mask, DNS, DHCP (dynamic vs.static), NAT (private and public).
- b. Characterize concepts of TCP/IP - Loopback addresses, Automatic IP addressing.
- c. Describe e-Mail protocol settings - SMTP, IMAP, POP.
- d. Explain FTP settings - Ports, IP addresses, Exceptions, Programs.
- e. Define proxy settings - Ports, IP addresses, Exceptions, Programs
- f. Use and interpret results of networking tools - Ping, Tracert, Nslookup, Netstat, Net use, Net /?, Ipconfig, telnet, SSH.
- g. Explain secure connection protocols - SSH, HTTPS
- h. Manage *firewall settings* -*Open and closed ports, Program filters*

Objective 5 Install and configure a small office home office (SOHO) network

- a. Explain the use of different network connection types - Dial-up, Broadband, Wireless, Routers / Access Points, LAN (10/100/1000BaseT, Speeds), Bluetooth (1.0 vs. 2.0), Cellular, Basic VoIP (consumer applications)
- b. List the basic concepts of hardware and software firewall configuration - Port assignment / setting up rules (exceptions), Port forwarding / port triggering
- c. Perform a *physical network installation* - *Wireless router*

STANDARD 5

Students will demonstrate an understanding common security practices.

Objective 1 Explain the basic principles of security concepts and technologies.

- a. Explain encryption technologies of networking.
- b. Tell the steps of data wiping / hard drive destruction / hard drive recycling.
- c. Describe a software firewall - Port security, Exceptions.
- d. List common authentication technologies - User name, Password, Biometrics, Smart cards.
- e. Basics of data sensitivity and data security - Compliance, Classifications, Social engineering

Objective 2 Summarize the following security features

- a. Implement wireless encryption - WEPx and WPAX, Client configuration (SSID).
- b. Describe malicious software protection - Viruses, Trojans, Worms, Spam, Spyware, Adware, Grayware.
- c. Tell how to implement BIOS Security - Drive lock, Passwords, Intrusion detection, TPM.
- d. Practice proper password management / password complexity.
- e. Outline the steps in locking a workstation - Hardware, Operating system.
- f. Describe Biometrics - Fingerprint scanner.

Objective 3 Implement security and troubleshoot common issues

- a. Secure the Operating systems - Local users and groups: Administrator, Power Users, Guest, Users, Vista User Access Control (UAC),
- b. Contrast NTFS vs. Share permissions, Shared files and folders - System files and folders, Encryption (Bitlocker, EFS), User authentication
- c. List the *steps to secure the system - BIOS security.*

STANDARD 6

Students will understand and use Operational Procedures

Objective 1 Outline the purpose of appropriate safety and environmental procedures and given a scenario apply them

- a. Define ESD.
- b. Define EMI - Network interference, Magnets.
- c. Define RFI - Cordless phone interference, Microwaves.
- d. Describe electrical safety - CRT, Power supply, Inverter, Laser printers, Matching power requirements of equipment with power distribution and UPSs.
- e. Tell why Material Safety Data Sheets (MSDS) are important.
- f. Demonstrate cable management relative to safety - Avoiding trip hazards.
- g. Explain how to practice physical safety - Heavy devices, Hot components.
- h. Characterize environmental concerns relative to personal computers – consider proper disposal procedures.

Objective 2 Given a scenario, demonstrate the appropriate use of communication skills and professionalism in the workplace

- a. Tell why it is important to use proper language – avoid jargon, acronyms, slang.
- b. Explain the benefits of maintaining a positive attitude.
- c. Describe why it is critical to listen and not interrupt a customer.
- d. Tell how to be culturally sensitive.
- e. Outline why it is important to be on time - If late contact the customer.
- f. Explain why one should avoid distractions - Personal calls, Talking to co-workers while interacting with customers, Personal interruptions.
- g. List several skills to deal 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.

- h. Tell why one should 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.
- i. Explain how to deal appropriately with customers confidential materials - Located on computer, desktop, printer, etc..