

# CompTIA A+ Essentials 2006 Examination Objectives

## Introduction

In order to receive CompTIA A+ certification a candidate must pass two exams. The first exam is CompTIA A+ Essentials. The CompTIA A+ Essentials Examination measures necessary competencies for an entry-level IT professional with the equivalent knowledge of at least 500 hours of hands-on experience in the lab or field. Hands-on experience or equivalent knowledge includes installing, building, upgrading, repairing, configuring, troubleshooting, optimizing, diagnosing, and performing preventive maintenance of basic personal computer hardware and operating systems.

CompTIA recently convened a core of CompTIA A+ subject matter experts representing a diverse group of employers, educators and IT professionals which resulted in the revised CompTIA A+ examinations objectives. The skills and knowledge measured by these objectives were validated through a survey of more than 5,000 CompTIA A+ certified professionals and employers. The results of the survey were used in weighting the domains and ensuring that the weighting is representative of the relative importance of that content to the job requirements of an entry-level IT professional. The intent is to certify individuals in a body of knowledge that is identified and accepted as the baseline or foundation of an entry-level IT professional.

This examination blueprint includes domain weighting, test objectives, and example content. Example topics and concepts are included to clarify the test objectives and should not be construed as a comprehensive listing of all the content of this examination.

The table below lists the domains measured by this examination and the extent to which they are represented. CompTIA A+ Essentials (2007 Edition) exams are based on these objectives.

Domain	Percentage of Examination
1.0 Personal Computer Components	21%
2.0 Laptop and Portable Devices	11%
3.0 Operating Systems	21%
4.0 Printers and Scanners	9%
5.0 Networks	12%
6.0 Security	11%
7.0 Safety and Environmental Issues	10%
8.0 Communication and Professionalism	5%
<b>Total</b>	<b>100%</b>

*CompTIA is constantly reviewing the content of our exams and updating test questions to be sure our exams are current and the security of the questions is protected. When necessary, we will publish updated exams based on existing exam objectives. Please know that all related exam preparation materials will still be valid.*

# 1.0 Personal Computer Components

## 1.1 Identify the fundamental principles of using personal computers

- Identify the names, purposes and characteristics of storage devices
  - FDD
  - HDD
  - CD / DVD / RW (e.g. drive speeds, media types)
  - Removable storage (e.g. tape drive, solid state such as thumb drive, flash and SD cards, USB, external CD-RW and hard drive)
- Identify the names, purposes and characteristics of motherboards
  - Form Factor (e.g. ATX / BTX, micro ATX / NLX)
  - Components
    - Integrated I/Os (e.g. sound, video, USB, serial, IEEE 1394 / firewire, parallel, NIC, modem)
    - Memory slots (e.g. RIMM, DIMM)
    - Processor sockets
    - External cache memory
    - Bus architecture
    - Bus slots (e.g. PCI, AGP, PCIe, AMR, CNR)
    - EIDE / PATA
    - SATA
    - SCSI Technology
  - Chipsets
  - BIOS / CMOS / Firmware
  - Riser card / daughter board
- Identify the names, purposes and characteristics of power supplies, for example: AC adapter, ATX, proprietary, voltage
- Identify the names purposes and characteristics of processor / CPUs
  - CPU chips (e.g. AMD, Intel)
  - CPU technologies
    - Hyperthreading
    - Dual core
    - Throttling
    - Micro code (MMX)
    - Overclocking
    - Cache
    - VRM
    - Speed (real vs. actual)
    - 32 vs. 64 bit
- Identify the names, purposes and characteristics of memory
  - Types of memory (e.g. DRAM, SRAM, SDRAM, DDR / DDR2, RAMBUS)
  - Operational characteristics
    - Memory chips (8, 16, 32)
    - Parity versus non-parity
    - ECC vs. non-ECC
    - Single-sided vs. double-sided
- Identify the names, purposes and characteristics of display devices, for example: projectors, CRT and LCD
  - Connector types (e.g. VGA, DVI / HDMi, S-Video, Component / RGB)
  - Settings (e.g. V-hold, refresh rate, resolution)
- Identify the names, purposes and characteristics of input devices for example: mouse, keyboard, bar code reader, multimedia (e.g. web and digital cameras, MIDI, microphones), biometric devices, touch screen.
- Identify the names, purposes and characteristics of adapter cards
  - Video including PCI / PCIe and AGP

- Multimedia
- I / O (SCSI, serial, USB, Parallel)
- Communications including network and modem
- Identify the names, purposes and characteristics of ports and cables for example: USB 1.1 and 2.0, parallel, serial, IEEE 1394 / firewire, RJ45 and RJ11, PS2 / Mini-DIN, centronics (e.g. mini, 36) multimedia (e.g. 1 / 8 connector, MIDI Coaxial, SPDIF)
- Identify the names, purposes and characteristics of cooling systems for example heat sinks, CPU and case fans, liquid cooling systems, thermal compound

### **1.2 Install, configure, optimize and upgrade personal computer components**

- Add, remove and configure internal and external storage devices
  - Drive preparation of internal storage devices including format / file systems and imaging technology
- Install display devices
- Add, remove and configure basic input and multimedia devices

### **1.3 Identify tools, diagnostic procedures and troubleshooting techniques for personal computer components**

- Recognize the basic aspects of troubleshooting theory for example:
  - Perform backups before making changes
  - Assess a problem systematically and divide large problems into smaller components to be analyzed individually
  - Verify even the obvious, determine whether the problem is something simple and make no assumptions
  - Research ideas and establish priorities
  - Document findings, actions and outcomes
- Identify and apply basic diagnostic procedures and troubleshooting techniques for example:
  - Identify the problem including questioning user and identifying user changes to computer
  - Analyze the problem including potential causes and make an initial determination of software and / or hardware problems
  - Test related components including inspection, connections, hardware / software configurations, device manager and consult vendor documentation
  - Evaluate results and take additional steps if needed such as consultation, use of alternate resources, manuals
  - Document activities and outcomes
- Recognize and isolate issues with display, power, basic input devices, storage, memory, thermal, POST errors (e.g. BIOS, hardware)
- Apply basic troubleshooting techniques to check for problems (e.g. thermal issues, error codes, power, connections including cables and / or pins, compatibility, functionality, software / drivers ) with components for example:
  - Motherboards
  - Power supply
  - Processor / CPUs
  - Memory
  - Display devices
  - Input devices
  - Adapter cards
- Recognize the names, purposes, characteristics and appropriate application of tools for example: BIOS, self-test, hard drive self-test and software diagnostics test

### **1.4 Perform preventive maintenance on personal computer components**

- Identify and apply basic aspects of preventive maintenance theory for example:
  - Visual / audio inspection

- Driver / firmware updates
- Scheduling preventive maintenance
- Use of appropriate repair tools and cleaning materials
- Ensuring proper environment
- Identify and apply common preventive maintenance techniques for devices such as input devices and batteries

## 2.0 Laptops and Portable Devices

### 2.1 Identify the fundamental principles of using laptops and portable devices

- Identify names, purposes and characteristics of laptop-specific:
  - Form factors such as memory and hard drives
  - Peripherals (e.g. docking station, port replicator and media / accessory bay)
  - Expansion slots (e.g. PCMCIA I, II and III, card and express bus)
  - Ports (e.g. mini PCI slot)
  - Communication connections (e.g. Bluetooth, infrared, cellular WAN, Ethernet)
  - Power and electrical input devices (e.g. auto-switching and fixed-input power supplies, batteries)
  - LCD technologies (e.g. active and passive matrix, resolution such as XGA, SXGA+, UXGA, WUXGA, contrast ratio, native resolution)
  - Input devices (e.g. stylus / digitizer, function (Fn) keys and pointing devices such as touch pad, point stick / track point)
- Identify and distinguish between mobile and desktop motherboards and processors including throttling, power management and WiFi

### 2.2 Install, configure, optimize and upgrade laptops and portable devices

- Configure power management
  - Identify the features of BIOS-ACPI
  - Identify the difference between suspend, hibernate and standby
- Demonstrate safe removal of laptop-specific hardware such as peripherals, hot-swappable devices and non-hot-swappable devices

### 2.3 Identify tools, basic diagnostic procedures and troubleshooting techniques for laptops and portable devices

- Use procedures and techniques to diagnose power conditions, video, keyboard, pointer and wireless card issues, for example:
  - Verify AC power (e.g. LEDs, swap AC adapter)
  - Verify DC power
  - Remove unneeded peripherals
  - Plug in external monitor
  - Toggle Fn keys
  - Check LCD cutoff switch
  - Verify backlight functionality and pixilation
  - Stylus issues (e.g. digitizer problems)
  - Unique laptop keypad issues
  - Antenna wires

### 2.4 Perform preventive maintenance on laptops and portable devices

- Identify and apply common preventive maintenance techniques for laptops and portable devices, for example: cooling devices, hardware and video cleaning materials, operating environments including temperature and air quality, storage, transportation and shipping.

### **3.0 Operating Systems – unless otherwise noted, operating systems referred to within include Microsoft Windows 2000, XP Professional, XP Home and Media Center.**

#### **3.1 Identify the fundamentals of using operating systems**

- Identify differences between operating systems (e.g. Mac, Windows, Linux) and describe operating system revision levels including GUI, system requirements, application and hardware compatibility
- Identify names, purposes and characteristics of the primary operating system components including registry, virtual memory and file system
- Describe features of operating system interfaces, for example:
  - Windows Explorer
  - My Computer
  - Control Panel
  - Command Prompt
  - My Network Places
  - Task bar / systray
  - Start Menu
- Identify the names, locations, purposes and characteristics of operating system files for example:
  - BOOT.INI
  - NTLDR
  - NTDETECT.COM
  - NTBOOTDD.SYS
  - Registry data files
- Identify concepts and procedures for creating, viewing, managing disks, directories and files in operating systems for example:
  - Disks (e.g. active, primary, extended and logical partitions)
  - File systems (e.g. FAT 32, NTFS)
  - Directory structures (e.g. create folders, navigate directory structures)
  - Files (e.g. creation, extensions, attributes, permissions)

#### **3.2 Install, configure, optimize and upgrade operating systems – references to upgrading from Windows 95 and NT may be made**

- Identify procedures for installing operating systems including:
  - Verification of hardware compatibility and minimum requirements
  - Installation methods (e.g. boot media such as CD, floppy or USB, network installation, drive imaging)
  - Operating system installation options (e.g. attended / unattended, file system type, network configuration)
  - Disk preparation order (e.g. start installation, partition and format drive)
  - Device driver configuration (e.g. install and upload device drivers)
  - Verification of installation
- Identify procedures for upgrading operating systems including:
  - Upgrade considerations (e.g. hardware, application and / or network compatibility)
  - Implementation (e.g. backup data, install additional Windows components)
- Install / add a device including loading, adding device drivers and required software including:
  - Determine whether permissions are adequate for performing the task
  - Device driver installation (e.g. automated and / or manual search and installation of device drivers)
  - Using unsigned drivers (e.g. driver signing)
  - Verify installation of the driver (e.g. device manager and functionality)
- Identify procedures and utilities used to optimize operating systems for example, virtual memory, hard drives, temporary files, service, startup and applications

### **3.3 Identify tools, diagnostic procedures and troubleshooting techniques for operating systems**

- Identify basic boot sequences, methods and utilities for recovering operating systems
  - Boot methods (e.g. safe mode, recovery console, boot to restore point)
  - Automated System Recovery (ASR) (e.g. Emergency Repair Disk (ERD))
- Identify and apply diagnostic procedures and troubleshooting techniques for example:
  - Identify the problem by questioning the user and identifying user changes to the computer
  - Analyze problem including potential causes and initial determination of software and / or hardware problem
  - Test related components including connections, hardware / software configurations, device manager and consulting vendor documentation
  - Evaluate results and take additional steps if needed such as consultation, alternate resources and manuals
  - Document activities and outcomes
- Recognize and resolve common operational issues such as bluescreen, system lock-up, input / output device, application install, start or load and Windows-specific printing problems (e.g. print spool stalled, incorrect / incompatible driver for print)
- Explain common error messages and codes for example:
  - Boot (e.g. invalid boot disk, inaccessible boot drive, missing NTLDR)
  - Startup (e.g. device / service failed to start, device / program in registry not found)
  - Event Viewer
  - Registry
  - Windows reporting
- Identify the names, locations, purposes and characteristics of operating system utilities for example:
  - Disk management tools (e.g. DEFRAG, NTBACKUP, CHKDSK, Format)
  - System management tools (e.g. device and task manager, MSCONFIG.EXE)
  - File management tools (e.g. Windows Explorer, ATTRIB.EXE)

### **3.4 Perform preventive maintenance on operating systems**

- Describe common utilities for performing preventive maintenance on operating systems for example, software and Windows updates (e.g. service packs), scheduled backups / restore, restore points

## **4.0 Printers and Scanners**

### **4.1 Identify the fundamental principles of using printers and scanners**

- Identify differences between types of printer and scanner technologies (e.g. laser, inkjet, thermal, solid ink, impact)
- Identify names, purposes and characteristics of printer and scanner components (e.g. memory, driver, firmware) and consumables (e.g. toner, ink cartridge, paper)
- Identify the names, purposes and characteristics of interfaces used by printers and scanners including port and cable types for example:
  - Parallel
  - Network (e.g. NIC, print servers)
  - USB
  - Serial
  - IEEE 1394 / firewire
  - Wireless (e.g. Bluetooth, 802.11, infrared)
  - SCSI

#### **4.2 Identify basic concepts of installing, configuring, optimizing and upgrading printers and scanners**

- Install and configure printers / scanners
  - Power and connect the device using local or network port
  - Install and update device driver and calibrate the device
  - Configure options and default settings
  - Print a test page
- Optimize printer performance for example, printer settings such as tray switching, print spool settings, device calibration, media types and paper orientation

#### **4.3 Identify tools, basic diagnostic procedures and troubleshooting techniques for printers and scanners**

- Gather information about printer / scanner problems
  - Identify symptom
  - Review device error codes, computer error messages and history (e.g. event log, user reports)
  - Print or scan test page
  - Use appropriate generic or vendor-specific diagnostic tools including web-based utilities
- Review and analyze collected data
  - Establish probable causes
  - Review service documentation
  - Review knowledge base and define and isolate the problem (e.g. software vs. hardware, driver, connectivity, printer)
- Identify solutions to identified printer / scanner problems
  - Define specific cause and apply fix
  - Replace consumables as needed
  - Verify functionality and get user acceptance of problem fix

## **5.0 Networks**

### **5.1 Identify the fundamental principles of networks**

- Describe basic networking concepts
  - Addressing
  - Bandwidth
  - Status indicators
  - Protocols (e.g. TCP / IP including IP, classful subnet, IPX / SPX including NWLINK, NETBEUI / NETBIOS)
  - Full-duplex, half-duplex
  - Cabling (e.g. twisted pair, coaxial cable, fiber optic, RS-232, USB, IEEE 1394 / Firewire)
  - Networking models including peer-to-peer and client / server
- Identify names, purposes and characteristics of the common network cables
  - Plenum / PVC
  - UTP (e.g. CAT3, CAT5 / 5e, CAT6)
  - STP
  - Fiber (e.g. single-mode and multi-mode)
- Identify names, purposes and characteristics of network connectors (e.g. RJ45 and RJ11, ST / SC / LC, MT-RJ)
- Identify names, purposes and characteristics (e.g. definition, speed and connections) of technologies for establishing connectivity for example:
  - LAN / WAN
  - ISDN
  - Broadband (e.g. DSL, cable, satellite)

- Dial-up
- Wireless (all 802.11)
- Infrared
- Bluetooth
- Cellular
- VoIP

### **5.2 Install, configure, optimize and upgrade networks**

- Install and configure network cards (physical address)
- Install, identify and obtain wired and wireless connection

### **5.3 Identify tools, diagnostic procedures and troubleshooting techniques for networks**

- Explain status indicators, for example speed, connection and activity lights and wireless signal strength

## **6.0 Security**

### **6.1 Identify the fundamental principles of security**

- Identify names, purposes and characteristics of hardware and software security for example:
  - Hardware deconstruction / recycling
  - Smart cards / biometrics (e.g. key fobs, cards, chips and scans)
  - Authentication technologies (e.g. user name, password, biometrics, smart cards)
  - Malicious software protection (e.g. viruses, Trojans, worms, spam, spyware, adware, grayware)
  - Software firewalls
  - File system security (e.g. FAT32 and NTFS)
- Identify names, purposes and characteristics of wireless security for example:
  - Wireless encryption (e.g. WEP.x and WPA.x) and client configuration
  - Access points (e.g. disable DHCP / use static IP, change SSID from default, disable SSID broadcast, MAC filtering, change default username and password, update firmware, firewall)
- Identify names, purposes and characteristics of data and physical security
  - Data access (basic local security policy)
  - Encryption technologies
  - Backups
  - Data migration
  - Data / remnant removal
  - Password management
  - Locking workstation (e.g. hardware, operating system)
- Describe importance and process of incident reporting
- Recognize and respond appropriately to social engineering situations

### **6.2 Install, configure, upgrade and optimize security**

- Install, configure, upgrade and optimize hardware, software and data security for example:
  - BIOS
  - Smart cards
  - Authentication technologies
  - Malicious software protection
  - Data access (basic local security policy)
  - Backup procedures and access to backups
  - Data migration
  - Data / remnant removal

### **6.3 Identify tool, diagnostic procedures and troubleshooting techniques for security**

- Diagnose and troubleshoot hardware, software and data security issues for example:
  - BIOS
  - Smart cards, biometrics
  - Authentication technologies
  - Malicious software
  - File system (e.g. FAT32, NTFS)
  - Data access (e.g. basic local security policy)
  - Backup
  - Data migration

### **6.4 Perform preventive maintenance for computer security**

- Implement software security preventive maintenance techniques such as installing service packs and patches and training users about malicious software prevention technologies

## **7.0 Safety and Environmental Issues**

### **7.1 Describe the aspects and importance of safety and environmental issues**

- Identify potential safety hazards and take preventive action
- Use Material Safety Data Sheets (MSDS) or equivalent documentation and appropriate equipment documentation
- Use appropriate repair tools
- Describe methods to handle environmental and human (e.g. electrical, chemical, physical) accidents including incident reporting

### **7.2 Identify potential hazards and implement proper safety procedures including ESD precautions and procedures, safe work environment and equipment handling**

### **7.3 Identify proper disposal procedures for batteries, display devices and chemical solvents and cans**

## **8.0 Communication and Professionalism**

### **8.1 Use good communication skills including listening and tact / discretion, when communicating with customers and colleagues**

- Use clear, concise and direct statements
- Allow the customer to complete statements – avoid interrupting
- Clarify customer statements – ask pertinent questions
- Avoid using jargon, abbreviations and acronyms
- Listen to customers

### **8.2 Use job-related professional behavior including notation of privacy, confidentiality and respect for the customer and customers' property**

- Behavior
  - Maintain a positive attitude and tone of voice
  - Avoid arguing with customers and / or becoming defensive
  - Do not minimize customers' problems
  - Avoid being judgmental and / or insulting or calling the customer names
  - Avoid distractions and / or interruptions when talking with customers
- Property
  - Telephone, laptop, desktop computer, printer, monitor, etc.