CompTIA A+ Essentials (2009 Edition) Objectives
Exam Number: 220-701

Introduction

In order to receive CompTIA A+ certification a candidate must pass two exams. The first exam is CompTIA A+ Essentials, exam number 220-701. 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. Successful candidates will have the knowledge required to understand the fundamentals of computer technology, networking, and security, and will have the skills required to identify hardware, peripheral, networking, and security components. Successful candidates will understand the basic functionality of the operating system and basic troubleshooting methodology, practice proper safety procedures, and will effectively interact with customers and peers.

CompTIA A+ is ISO 17024 Accredited (Personnel Certification Accreditation) and, as such, undergoes regular reviews and updates to the exam objectives. The following CompTIA A+ Essentials objectives reflect the subject areas in the 2009 Edition of the exam and result from subject matter expert workshops and industry-wide survey results regarding the skills and knowledge required of an entry-level IT professional. The percentages in this document represent the relative importance of the subject areas (domains) in the associated body of knowledge, and together establish the 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.

Candidates are encouraged to use this document to guide their studies. The contents of the examination blueprint help prioritize topics and provide a guide of what to expect on the CompTIA A+ Essentials exam. The table below lists the domains measured by this examination and the extent to which they are represented. The CompTIA A+ Essentials (2009 Edition) exam is based on these objectives.

Domain	**Percentage of Examination**
1.0 Hardware	27%
2.0 Troubleshooting, Repair & Maintenance	20%
3.0 Operating System and Software	20%
4.0 Networking	15%
5.0 Security	8%
6.0 Operational Procedure	10%
Total	100%

**Note: The lists of examples provided in bulleted format below each objective are not exhaustive lists. Other examples of technologies, processes or tasks pertaining to each objective may also be included on the exam although not listed or covered in this objectives document.

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 Hardware

1.1 Categorize storage devices and backup media

- FDD
- HDD
  - Solid state vs. magnetic
- Optical drives
  - CD / DVD / RW / Blu-Ray
- Removable storage
  - Tape drive
  - Solid state (e.g. thumb drive, flash, SD cards, USB)
  - External CD-RW and hard drive
  - Hot swappable devices and non-hot swappable devices

1.2 Explain motherboard components, types and features

- Form Factor
  - ATX / BTX,
  - micro ATX
  - NLX
- I/O interfaces
  - Sound
  - Video
  - USB 1.1 and 2.0
  - Serial
  - IEEE 1394 / Firewire
  - Parallel
  - NIC
  - Modem
  - PS/2
- Memory slots
  - RIMM
  - DIMM
  - SODIMM
  - SIMM
- Processor sockets
- Bus architecture
- Bus slots
  - PCI
  - AGP
  - PCIe
  - AMR
  - CNR
  - PCMCIA
- PATA
  - IDE
  - EIDE
- SATA, eSATA
- Contrast RAID (levels 0, 1, 5)
- Chipsets
- BIOS / CMOS / Firmware
  - POST

    - CMOS battery
- Riser card / daughterboard

1.3 Classify power supplies types and characteristics

- AC adapter
- ATX proprietary
- Voltage, wattage and capacity
- Voltage selector switch
- Pins (20, 24)

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

1.5 Explain cooling methods and devices

- Heat sinks
- CPU and case fans
- Liquid cooling systems
- Thermal compound

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

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

1.8 Install and configure peripherals and input devices

- Mouse
- Keyboard
- Bar code reader
- Multimedia (e.g. web and digital cameras, MIDI, microphones)
- Biometric devices
- Touch screen
- KVM switch

1.9 Summarize the function and types of adapter cards

- Video
    - PCI
    - PCIe
    - AGP
- Multimedia
    - Sound card
    - TV tuner cards
    - Capture cards
- I/O
    - SCSI
    - Serial
    - USB
    - Parallel
- Communications
    - NIC
    - Modem

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)

1.11 Install and configure printers

- Differentiate between printer types
    - Laser
    - Inkjet
    - Thermal
    - Impact
- Local vs. network printers
- Printer drivers (compatibility)
- Consumables

2.0 Troubleshooting, Repair and Maintenance

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

- OS related symptoms
    - Bluescreen
    - System lock-up
    - Input/output device
    - Application install
    - Start or load
    - Windows specific printing problems
        - Print spool stalled
        - Incorrect / incompatible driver
- Hardware related symptoms
    - Excessive heat
    - Noise
    - Odors
    - Status light indicators
    - Alerts
    - Visible damage (e.g. cable, plastic)
- Use documentation and resources
    - User / installation manuals
    - Internet / web based
    - Training materials

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

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

2.5 Given a scenario, integrate common preventative maintenance techniques

- Physical inspection
- Updates
  - Driver
  - Firmware
  - OS
  - Security
- Scheduling preventative maintenance
  - Defrag
  - Scandisk
  - Check disk
  - Startup programs
- 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

3.0 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.

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
- User interface, start bar layout

3.2 Given a scenario, demonstrate proper use of user interfaces

- Windows Explorer
- My Computer
- Control Panel
- Command prompt utilities
  - telnet
  - ping
  - ipconfig
- Run line utilities
  - msconfig
  - msinfo32
  - Dxdiag
  - Cmd
  - REGEDIT
- My Network Places
- Task bar / systray
- Administrative tools
  - Performance monitor, Event Viewer, Services, Computer Management
- MMC
- Task Manager
- Start Menu

3.3 Explain the process and steps to install and configure the Windows OS

- File systems
  - FAT32 vs. NTFS
- Directory structures
  - Create folders
  - Navigate directory structures
- Files
  - Creation
  - Extensions
  - Attributes
  - Permissions
- Verification of hardware compatibility and minimum requirements
- Installation methods
  - Boot media such as CD, floppy or USB
  - Network installation
  - Install from image
  - Recover CD
  - Factory recovery partition
- Operating system installation options
  - File system type
  - Network configuration
  - Repair install
- Disk preparation order
  - Format drive
  - Partition
  - Start installation
- Device Manager
  - Verify

    - Install and update devices drivers
    - Driver signing
- User data migration – User State Migration Tool (USMT)
- Virtual memory
- Configure power manangement
    - Suspend
    - Wake on LAN
    - Sleep timers
    - Hibernate
    - Standby
- Demonstrate safe removal of peripherals

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)
- Boot options
    - Safe mode
    - Boot to restore point
    - Recovery options
        - Automated System Recovery (ASR)
        - Emergency Repair Disk (ERD)
        - Recovery console

4.0 Networking

4.1 Summarize the basics of networking fundamentals, including technologies, devices and protocols

- Basics of configuring IP addressing and TCP/IP properties (DHCP, DNS)
- Bandwidth and latency
- Status indicators
- Protocols (TCP/IP, NETBIOS)
- Full-duplex, half-duplex
- Basics of workgroups and domains
- Common ports: HTTP, FTP, POP, SMTP, TELNET, HTTPS
- LAN / WAN
- Hub, switch and router
- Identify Virtual Private Networks (VPN)
- Basics class identification

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

4.3 Compare and contrast the different network types

- Broadband
    - DSL

    - Cable
    - Satellite
    - Fiber
- Dial-up
- Wireless
    - All 802.11 types
    - WEP
    - WPA
    - SSID
    - MAC filtering
    - DHCP settings
- Bluetooth
- Cellular

5.0 Security

5.1 Explain the basic principles of security concepts and technologies

- Encryption technologies
- Data wiping / hard drive destruction / hard drive recycling
- Software firewall
    - Port security
    - Exceptions
- Authentication technologies
    - User name
    - Password
    - Biometrics
    - Smart cards
- Basics of data sensitivity and data security
    - Compliance
    - Classifications
    - Social engineering

5.2 Summarize the following security features

- Wireless encryption
    - WEPx and WPAx
    - Client configuration (SSID)
- Malicious software protection
    - Viruses
    - Trojans
    - Worms
    - Spam
    - Spyware
    - Adware
    - Grayware
- BIOS Security
    - Drive lock
    - Passwords
    - Intrusion detection
    - TPM
- Password management / password complexity
- Locking workstation
    - Hardware
    - Operating system

- Biometrics
    - Fingerprint scanner

6.0 Operational Procedure

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

- ESD
- EMI
    - Network interference
    - Magnets
- RFI
    - Cordless phone interference
    - Microwaves
- Electrical safety
    - CRT
    - Power supply
    - Inverter
    - Laser printers
    - Matching power requirements of equipment with power distribution and UPSs
- Material Safety Data Sheets (MSDS)
- Cable management
    - Avoiding trip hazards
- Physical safety
    - Heavy devices
    - Hot components
- Environmental – consider proper disposal procedures

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.

CompTIA A+ Acronyms

Introduction

The following is a list of acronyms which appear on the CompTIA A+ exams. Candidates are encouraged to review the complete list and attain a working knowledge of all listed acronyms as a part of a comprehensive exam preparation program.

ACRONYM	SPELLED OUT
AC	alternating current
ACL	access control list
ACPI	advanced configuration and power interface
ACT	activity
ADSL	asymmetrical digital subscriber line
AGP	accelerated graphics port
AMD	advanced micro devices
APIPA	automatic private internet protocol addressing
APM	advanced power management
ARP	address resolution protocol
ASR	automated system recovery
AT	advanced technology
ATA	advanced technology attachment
ATAPI	advanced technology attachment packet interface
ATM	asynchronous transfer mode
ATX	advanced technology extended
BIOS	basic input/output system
BNC	Bayonet-Neill-Concelman or British Naval Connector
BTX	balanced technology extended
CD	compact disc
CD-ROM	compact disc-read-only memory
CD-RW	compact disc-rewritable
CDFS	compact disc file system
CFS	Central File System, Common File System, Command File System
CMOS	complementary metal-oxide semiconductor
COMx	communication port (x=port number)
CPU	central processing unit
CRT	cathode-ray tube
DAC	discretionary access control
DB-25	serial communications D-shell connector, 25 pins
DB-9	9 pin D shell connector
DC	direct current
DDOS	distributed denial of service
DDR	double data-rate
DDR RAM	double data-rate random access memory

DDR SDRAM	double data-rate synchronous dynamic random access memory
DFS	distributed file system
DHCP	dynamic host configuration protocol
DIMM	dual inline memory module
DIN	Deutsche Industrie Norm
DIP	dual inline package
DLT	digital linear tape
DLP	digital light processing
DMA	direct memory access
DMZ	demilitarized zone
DNS	domain name service or domain name server
DOS	denial of service
DPMS	display power management signaling
DRAM	dynamic random access memory
DSL	digital subscriber line
DVD	digital video disc or digital versatile disc
DVD-RAM	digital video disc-random access memory
DVD-ROM	digital video disc-read only memory
DVD-R	digital video disc-recordable
DVD-RW	digital video disc-rewritable
DVI	digital visual interface
ECC	error correction code
ECP	extended capabilities port
EEPROM	electrically erasable programmable read-only memory
EFS	encrypting file system
EIDE	enhanced integrated drive electronics
EMI	electromagnetic interference
EMP	electromagnetic pulse
EPROM	erasable programmable read-only memory
EPP	enhanced parallel port
ERD	emergency repair disk
ESD	electrostatic discharge
EVGA	extended video graphics adapter/array
EVDO	evolution data optimized or evolution data only
FAT	file allocation table
FAT12	12-bit file allocation table
FAT16	16-bit file allocation table
FAT32	32-bit file allocation table
FDD	floppy disk drive
Fn	Function (referring to the function key on a laptop)
FPM	fast page-mode
FRU	field replaceable unit
FSB	Front Side Bus
FTP	file transfer protocol

FQDN	fully qualified domain name
Gb	gigabit
GB	gigabyte
GDI	graphics device interface
GHz	gigahertz
GUI	graphical user interface
GPS	global positioning system
GSM	global system for mobile communications
HAL	hardware abstraction layer
HCL	hardware compatibility list
HDD	hard disk drive
HDMi	high definition media interface
HPFS	high performance file system
HTML	hypertext markup language
HTTP	hypertext transfer protocol
HTTPS	hypertext transfer protocol over secure sockets layer
I/O	input/output
ICMP	internet control message protocol
ICR	intelligent character recognition
IDE	integrated drive electronics
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics Engineers
IIS	Internet Information Services
IMAP	internet mail access protocol
IP	internet protocol
IPCONFIG	internet protocol configuration
IPP	internet printing protocol
IPSEC	internet protocol security
IPX	internetwork packet exchange
IPX/SPX	internetwork packet exchange/sequenced packet exchange
IR	infrared
IrDA	Infrared Data Association
IRQ	interrupt request
ISA	industry standard architecture
ISDN	integrated services digital network
ISO	Industry Standards Organization
ISP	internet service provider
JBOD	just a bunch of disks
Kb	kilobit
KB	Kilobyte or knowledge base
LAN	local area network
LBA	logical block addressing
LC	Lucent connector
LCD	liquid crystal display

LDAP	lightweight directory access protocol
LED	light emitting diode
Li-on	lithium-ion
LPD/LPR	line printer daemon / line printer remote
LPT	line printer terminal
LPT1	line printer terminal 1
LVD	low voltage differential
MAC	media access control / mandatory access control
MAPI	messaging application programming interface
MAU	media access unit, media attachment unit
Mb	megabit
MB	megabyte
MBR	master boot record
MBSA	Microsoft Baseline Security Analyzer
MFD	multi-function device
MFP	multi-function product
MHz	megahertz
MicroDIMM	micro dual inline memory module
MIDI	musical instrument digital interface
MIME	multipurpose internet mail extension
MLI	multiple link interface
MMC	Microsoft management console
MMX	multimedia extensions
MP3	Moving Picture Experts Group Layer 3 Audio
MP4	Moving Picture Experts Group Layer 4
MPEG	Moving Picture Experts Group
MSCONFIG	Microsoft configuration
MSDS	material safety data sheet
MUI	multilingual user interface
NAC	network access control
NAS	network-attached storage
NAT	network address translation
NetBIOS	networked basic input/output system
NetBEUI	networked basic input/output system extended user interface
NFS	network file system
NIC	network interface card
NiCd	nickel cadmium
NiMH	nickel metal hydride
NLX	new low-profile extended
NNTP	network news transfer protocol
NTFS	new technology file system
NTLDR	new technology loader
NTP	Network Time Protocol
OCR	optical character recognition

OEM	original equipment manufacturer
OS	operating system
PAN	personal area network
PATA	parallel advanced technology attachment
PC	personal computer
PCI	peripheral component interconnect
PCIe	peripheral component interconnect express
PCIX	peripheral component interconnect extended
PCL	printer control language
PCMCIA	Personal Computer Memory Card International Association
PDA	personal digital assistant
PGA	pin grid array
PGA2	pin grid array 2
PIN	personal identification number
PKI	public key infrastructure
PnP	plug and play
POP3	post office protocol 3
POST	power-on self test
POTS	plain old telephone service
PPP	point-to-point protocol
PPTP	point-to-point tunneling protocol
PRI	primary rate interface
PROM	programmable read-only memory
PS/2	personal system/2 connector
PSTN	public switched telephone network
PSU	power supply unit
PVC	permanent virtual circuit
PXE	preboot execution environment
QoS	quality of service
RAID	redundant array of independent (or inexpensive) discs
RAM	random access memory
RAS	remote access service
RDRAM	RAMBUS® dynamic random access memory
RDP	Remote Desktop Protocol
RF	radio frequency
RFI	radio frequency interference
RGB	red green blue
RIMM	RAMBUS® inline memory module
RIP	routing information protocol
RIS	remote installation service
RISC	reduced instruction set computer
RJ	registered jack
RJ-11	registered jack function 11
RJ-45	registered jack function 45

RMA	returned materials authorization
ROM	read only memory
RS-232 or RS-232C	recommended standard 232
RTC	real-time clock
SAN	storage area network
SATA	serial advanced technology attachment
SC	subscription channel
SCP	secure copy protection
SCSI	small computer system interface
SCSI ID	small computer system interface identifier
SD card	secure digital card
SDRAM	synchronous dynamic random access memory
SEC	single edge connector
SFC	system file checker
SGRAM	synchronous graphics random access memory
SIMM	single inline memory module
SLI	scalable link interface or system level integration or scanline interleave mode
S.M.A.R.T.	self-monitoring, analysis, and reporting technology
SMB	server message block or small to midsize business
SMTP	simple mail transport protocol
SNMP	simple network management protocol
SoDIMM	small outline dual inline memory module
SOHO	small office/home office
SP	service pack
SP1	service pack 1
SP2	service pack 2
SP3	service pack 3
SP4	service pack 4
SPDIF	Sony-Philips digital interface format
SPGA	staggered pin grid array
SPX	sequenced package exchange
SRAM	static random access memory
SSH	secure shell
SSID	service set identifier
SSL	secure sockets layer
ST	straight tip
STP	shielded twisted pair
SVGA	super video graphics array
SXGA	super extended graphics array
TB	terabyte
TCP	transmission control protocol
TCP/IP	transmission control protocol/internet protocol
TDR	time domain reflectometer
TFTP	trivial file transfer protocol

TPM	trusted platform module
UAC	user account control
UART	universal asynchronous receiver transmitter
UDF	user defined functions or universal disk format or universal data format
UDMA	ultra direct memory access
UDP	user datagram protocol
UNC	universal naming convention
UPS	uninterruptible power supply
URL	uniform resource locator
USB	universal serial bus
USMT	user state migration tool
UTP	unshielded twisted pair
UXGA	ultra extended graphics array
VESA	Video Electronics Standards Association
VFAT	virtual file allocation table
VGA	video graphics array
VoIP	voice over internet protocol
VPN	virtual private network
VRAM	video random access memory
WAN	wide area network
WAP	wireless application protocol
WEP	wired equivalent privacy
WIFI	wireless fidelity
WINS	windows internet name service
WLAN	wireless local area network
WPA	wireless protected access
WUXGA	wide ultra extended graphics array
XGA	extended graphics array
ZIF	zero-insertion-force
ZIP	zigzag inline package