

CompTIA A+ Certification Exam Objectives

EXAM NUMBER: 220-901



About the Exam

Candidates are encouraged to use this document to help prepare for CompTIA A+ 220-901. In order to receive the CompTIA A+ certification, you must pass two exams: 220-901 and 220-902. CompTIA A+ 220-901 measures the necessary skills for an entry-level IT professional. Successful candidates will have the knowledge required to:

- Assemble components based on customer requirements
- Install, configure and maintain devices, PCs and software for end users
- Understand the basics of networking and security/forensics
- Properly and safely diagnose, resolve and document common hardware and software issues
- Apply troubleshooting skills
- Provide appropriate customer support
- Understand the basics of virtualization, desktop imaging and deployment

These content examples are meant to clarify the test objectives and should not be construed as a comprehensive listing of all the content of this examination.

EXAM ACCREDITATION

CompTIA A+ is accredited by ANSI to show compliance with the ISO 17024 Standard and, as such, undergoes regular reviews and updates to the exam objectives.

EXAM DEVELOPMENT

CompTIA exams result from subject matter expert workshops and industry-wide survey results regarding the skills and knowledge required of an entry-level IT professional.

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PLEASE NOTE

The lists of examples provided in bulleted format 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.

TEST DETAILS

Required exam	CompTIA A+ 220-901
Number of questions	Maximum of 90
Types of questions	Multiple choice and performance-based
Length of test	90 minutes
Recommended experience	Six to 12 months hands-on experience in the lab or field
Passing score	CompTIA A+ 220-901: 675 (on a scale of 900)

EXAM OBJECTIVES (DOMAINS)

The table below lists the domains measured by this examination and the extent to which they are represented:

DOMAIN	PERCENTAGE OF EXAMINATION
1.0 Hardware	34%
2.0 Networking	21%
3.0 Mobile Devices	17%
4.0 Hardware & Network Troubleshooting	28%
Total	100%



1.0 Hardware

1.1 Given a scenario, configure settings and use BIOS/UEFI tools on a PC.

- **Firmware upgrades/flash BIOS**
- **BIOS component information**
 - RAM
 - Hard drive
 - Optical drive
 - CPU
- **BIOS configurations**
 - Boot sequence
- Enabling and disabling devices
- Date/time
- Clock speeds
- Virtualization support
- BIOS security (passwords, drive encryption: TPM, LoJack, secure boot)
- **Built-in diagnostics**
- **Monitoring**
 - Temperature monitoring
 - Fan speeds
 - Intrusion detection/notification
 - Voltage
 - Clock
 - Bus speed

1.2 Explain the importance of motherboard components, their purpose and properties.

- **Sizes**
 - ATX
 - Micro-ATX
 - Mini-ITX
 - ITX
- **Expansion slots**
 - PCI
 - PCI-X
 - PCIe
 - miniPCI
- **RAM slots**
- **CPU sockets**
- **Chipsets**
 - Northbridge
 - Southbridge
- **CMOS battery**
- **Power connections and types**
- **Fan connectors**
- **Front/top panel connectors**
 - USB
 - Audio
 - Power button
 - Power light
 - Drive activity lights
- **Bus speeds**
- **Reset button**

1.3 Compare and contrast various RAM types and their features.

- **Types**
 - DDR
 - DDR2
 - DDR3
 - SODIMM
 - DIMM
 - Parity vs. non-parity
- ECC vs. non-ECC
- RAM configurations
 - Single channel vs. dual channel vs. triple channel
- Single sided vs. double sided
- Buffered vs. unbuffered
- **RAM compatibility**

1.4 Install and configure PC expansion cards.

- Sound cards
 - Video cards
 - Network cards
 - USB cards
 - Firewire cards
 - Thunderbolt cards
 - Storage cards
 - Modem cards
 - Wireless/cellular cards
 - TV tuner cards
 - Video capture cards
 - Riser cards
-

1.5 Install and configure storage devices and use appropriate media.

- **Optical drives**
 - CD-ROM/CD-RW
 - DVD-ROM/DVD-RW/DVD-RW DL
 - Blu-ray
 - BD-R
 - BD-RE
 - **Magnetic hard disk drives**
 - 5400 rpm
 - 7200 rpm
 - 10,000 rpm
 - **Hot swappable drives**
 - **Solid state/flash drives**
 - Compact flash
 - SD
 - microSD
 - MiniSD
 - xD
 - SSD
 - Hybrid
 - eMMC
 - **RAID types**
 - 0
 - 1
 - 5
 - 10
 - **Tape drive**
 - **Media capacity**
 - CD
 - CD-RW
 - DVD-RW
 - DVD
 - Blu-ray
 - Tape
 - DVD DL
-

1.6 Install various types of CPUs and apply the appropriate cooling methods.

- **Socket types**
 - Intel: 775, 1155, 1156, 1366, 1150, 2011
 - AMD: AM3, AM3+, FM1, FM2, FM2+
- **Characteristics**
 - Speeds
 - Cores
 - Cache size/type
 - Hyperthreading
 - Virtualization support
 - Architecture (32-bit vs. 64-bit)
 - Integrated GPU
 - Disable execute bit
- **Cooling**
 - Heat sink
 - Fans
 - Thermal paste
 - Liquid-based
 - Fanless/passive

1.7 Compare and contrast various PC connection interfaces, their characteristics and purpose.

- **Physical connections**
 - USB 1.1 vs. 2.0 vs. 3.0
 - Connector types: A, B, mini, micro
 - Firewire 400 vs. Firewire 800
 - SATA1 vs. SATA2 vs. SATA3, eSATA
 - Other connector types
 - VGA
 - HDMI
 - DVI
- Audio
 - Analog
 - Digital (Optical connector)
- RJ-45
- RJ-11
- Thunderbolt
- **Wireless connections**
 - Bluetooth
 - RF
- IR
- NFC
- **Characteristics**
 - Analog
 - Digital
 - Distance limitations
 - Data transfer speeds
 - Quality
 - Frequencies

1.8 Install a power supply based on given specifications.

- **Connector types and their voltages**
 - SATA
 - Molex
 - 4/8-pin 12v
 - PCIe 6/8-pin
 - 20-pin
 - 24-pin
- **Specifications**
 - Wattage
 - Dual rail
 - Size
 - Number of connectors
 - ATX
 - MicroATX
 - Dual voltage options

1.9 Given a scenario, select the appropriate components for a custom PC configuration to meet customer specifications or needs.

- **Graphic/CAD/CAM design workstation**
 - Multicore processor
 - High-end video
 - Maximum RAM
- **Audio/video editing workstation**
 - Specialized audio and video card
 - Large fast hard drive
 - Dual monitors
- **Virtualization workstation**
 - Maximum RAM and CPU cores
- **Gaming PC**
 - Multicore processor
- High-end video/specialized GPU
- High-definition sound card
- High-end cooling
- **Home theater PC**
 - Surround sound audio
 - HDMI output
 - HTPC compact form factor
 - TV tuner
- **Standard thick client**
 - Desktop applications
 - Meets recommended requirements for selected OS
- **Thin client**
 - Basic applications
 - Meets minimum requirements for selected OS
 - Network connectivity
- **Home server PC**
 - Media streaming
 - File sharing
 - Print sharing
 - Gigabit NIC
 - RAID array

1.10 Compare and contrast types of display devices and their features.

- **Types**
 - LCD
 - TN vs. IPS
 - Fluorescent vs. LED backlighting
 - Plasma
 - Projector
 - OLED
 - **Refresh/frame rates**
 - **Resolution**
 - **Native resolution**
 - **Brightness/lumens**
 - **Analog vs. digital**
 - **Privacy/antiglare filters**
 - **Multiple displays**
 - **Aspect ratios**
 - 16:9
 - 16:10
 - 4:3
-

1.11 Identify common PC connector types and associated cables.

- **Display connector types**
 - DVI-D
 - DVI-I
 - DVI-A
 - DisplayPort
 - RCA
 - HD15 (i.e., DE15 or DB15)
 - BNC
 - miniHDMI
 - miniDin-6
 - **Display cable types**
 - HDMI
 - DVI
 - VGA
 - Component
 - Composite
 - Coaxial
 - **Device cables and connectors**
 - SATA
 - eSATA
 - USB
 - Firewire (IEEE1394)
 - PS/2
 - Audio
 - **Adapters and convertors**
 - DVI to HDMI
 - USB A to USB B
 - USB to Ethernet
 - DVI to VGA
 - Thunderbolt to DVI
 - PS/2 to USB
 - HDMI to VGA
-

1.12 Install and configure common peripheral devices.

- **Input devices**
 - Mouse
 - Keyboard
 - Scanner
 - Barcode reader
 - Biometric devices
 - Game pads
 - Joysticks
 - Digitizer
 - Motion sensor
- **Touch pads**
- **Smart card readers**
- **Digital cameras**
- **Microphone**
- **Webcam**
- **Camcorder**
- **Output devices**
 - Printers
 - Speakers
 - Display devices
- **Input & output devices**
 - Touch screen
 - KVM
 - Smart TV
 - Set-top Box
 - MIDI-enabled devices

1.13 Install SOHO multifunction device/printers and configure appropriate settings.

- **Use appropriate drivers for a given operating system**
 - Configuration settings
 - Duplex
 - Collate
 - Orientation
 - Quality
 - **Device sharing**
 - Wired
 - USB
 - Serial
 - Ethernet
 - Wireless
 - Bluetooth
 - 802.11 (a/b/g/n/ac)
 - Infrastructure vs. ad hoc
 - Integrated print server (hardware)
 - Cloud printing/remote printing
 - **Public/shared devices**
 - Sharing local/networked device via operating system settings
 - TCP/Bonjour/AirPrint
 - Data privacy
 - User authentication on the device
 - Hard drive caching
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1.14 Compare and contrast differences between the various print technologies and the associated imaging process.

- **Laser**
 - Imaging drum, fuser assembly, transfer belt, transfer roller, pickup rollers, separate pads, duplexing assembly
 - Imaging process: processing, charging, exposing, developing, transferring, fusing and cleaning
 - **Inkjet**
 - Ink cartridge, print head, roller, feeder, duplexing assembly, carriage and belt
 - Calibration
 - **Thermal**
 - Feed assembly, heating element
 - Special thermal paper
 - **Impact**
 - Print head, ribbon, tractor feed
 - Impact paper
 - **Virtual**
 - Print to file
 - Print to PDF
 - Print to XPS
 - Print to image
-

1.15 Given a scenario, perform appropriate printer maintenance.

- **Laser**
 - Replacing toner, applying maintenance kit, calibration, cleaning
- **Thermal**
 - Replace paper, clean heating element, remove debris
- **Impact**
 - Replace ribbon, replace print head, replace paper
- **Inkjet**
 - Clean heads, replace cartridges, calibration, clear jams



2.0 Networking

2.1 Identify the various types of network cables and connectors.

- **Fiber**
 - Connectors: SC, ST and LC
- **Twisted Pair**
 - Connectors: RJ-11, RJ-45
 - Wiring standards: T568A, T568B
- **Coaxial**
 - Connectors: BNC, F-connector

2.2 Compare and contrast the characteristics of connectors and cabling.

- **Fiber**
 - Types (single-mode vs. multi-mode)
 - Speed and transmission limitations
- **Twisted pair**
 - Types: STP, UTP, CAT3, CAT5, CAT5e, CAT6, CAT6e, CAT7, plenum, PVC
 - Speed and transmission limitations
 - Splitters and effects on signal quality
- **Coaxial**
 - Types: RG-6, RG-59
 - Speed and transmission limitations
 - Splitters and effects on signal quality

2.3 Explain the properties and characteristics of TCP/IP.

- **IPv4 vs. IPv6**
- **Public vs. private vs. APIPA/link local**
- **Static vs. dynamic**
- **Client-side DNS settings**
- **Client-side DHCP**
- **Subnet mask vs. CIDR**
- **Gateway**

2.4 Explain common TCP and UDP ports, protocols and their purpose.

- **Ports**
 - 21 – FTP
 - 22 – SSH
 - 23 – TELNET
 - 25 – SMTP
 - 53 – DNS
 - 80 – HTTP
 - 110 – POP3
 - 143 – IMAP
 - 443 – HTTPS
 - 3389 – RDP
 - 137-139 – NetBIOS/NetBT
 - 445 – SMB/CIFS
 - 427 – SLP
 - 548 – AFP
 - LDAP
 - SNMP
 - SMB
 - CIFS
 - SSH
 - AFP
- **Protocols**
 - DHCP
 - DNS
- **TCP vs. UDP**

2.5 Compare and contrast various WiFi networking standards and encryption types.

- Standards
 - 802.11 (a/b/g/n/ac)
 - Speeds, distances and frequencies
 - Encryption types
 - WEP, WPA, WPA2, TKIP, AES
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2.6 Given a scenario, install and configure SOHO wireless/wired router and apply appropriate settings.

- Channels
 - Port forwarding, port triggering
 - DHCP (on/off)
 - DMZ
 - NAT/DNAT
 - Basic QoS
 - Firmware
 - UPnP
-

2.7 Compare and contrast Internet connection types, network types and their features.

- Internet connection types
 - Cable
 - DSL
 - Dial-up
 - Fiber
 - Satellite
 - ISDN
 - Cellular
 - Tethering
 - Mobile hotspot
 - Line-of-sight wireless Internet service
 - Network Types
 - LAN
 - WAN
 - PAN
 - MAN
-

2.8 Compare and contrast network architecture devices, their functions and features.

- Hub
 - Switch
 - Router
 - Access point
 - Bridge
 - Modem
 - Firewall
 - Patch panel
 - Repeaters/extenders
 - Ethernet over Power
 - Power over Ethernet injector
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2.9 Given a scenario, use appropriate networking tools.

- Crimper
- Cable stripper
- Multimeter
- Tone generator and probe
- Cable tester
- Loopback plug
- Punchdown tool
- WiFi analyzer



3.0 Mobile Devices

3.1 Install and configure laptop hardware and components.

- **Expansion options**
 - Expresscard /34
 - Expresscard /54
 - SODIMM
 - Flash
 - Ports/Adapters
 - Thunderbolt
 - DisplayPort
 - USB to RJ-45 dongle
 - USB to WiFi dongle
 - USB to Bluetooth
 - USB Optical Drive
- **Hardware/device replacement**
 - Keyboard
 - Hard drive
 - SSD vs. hybrid vs. magnetic disk
 - 1.8in vs. 2.5in
 - Memory
 - Smart card reader
 - Optical drive
 - Wireless card
 - Mini-PCIe
 - Screen
 - DC jack
 - Battery
 - Touchpad
 - Plastics/frames
 - Speaker
 - System board
 - CPU

3.2 Explain the function of components within the display of a laptop.

- **Types**
 - LCD
 - TN vs. IPS
 - Fluorescent vs. LED backlighting
 - OLED
- **WiFi antenna connector/placement**
- **Webcam**
- **Microphone**
- **Inverter**
- **Digitizer**

3.3 Given a scenario, use appropriate laptop features.

- **Special function keys**
 - Dual displays
 - Wireless (on/off)
 - Cellular (on/off)
 - Volume settings
 - Screen brightness
 - Bluetooth (on/off)
 - Keyboard backlight
 - Touch pad (on/off)
 - Screen orientation
 - Media options (fast forward/rewind)
 - GPS (on/off)
 - Airplane mode
- **Docking station**
- **Physical laptop lock and cable lock**
- **Rotating/removable screens**



3.4 Explain the characteristics of various types of other mobile devices.

- **Tablets**
 - **Smartphones**
 - **Wearable technology devices**
 - Smart watches
 - Fitness monitors
 - Glasses and headsets
 - **Phablets**
 - **e-Readers**
 - **Smart camera**
 - **GPS**
-

3.5 Compare and contrast accessories and ports of other mobile devices.

- **Connection types**
 - NFC
 - Proprietary vendor-specific ports (communication/power)
 - MicroUSB/miniUSB
 - Lightning
 - Bluetooth
- IR
- Hotspot/tethering
- **Accessories**
 - Headsets
 - Speakers
 - Game pads
 - Docking stations
- Extra battery packs/battery chargers
- Protective covers/water proofing
- Credit card readers
- Memory/MicroSD



4.0 Hardware and Network Troubleshooting

4.1 Given a scenario, troubleshoot common problems related to motherboards, RAM, CPU and power with appropriate tools.

- **Common symptoms**
 - Unexpected shutdowns
 - System lockups
 - POST code beeps
 - Blank screen on bootup
 - BIOS time and settings resets
 - Attempts to boot to incorrect device
 - Continuous reboots
- No power
- Overheating
- Loud noise
- Intermittent device failure
- Fans spin – no power to other devices
- Indicator lights
- Smoke
- Burning smell
- Proprietary crash screens (BSOD/pin wheel)
- Distended capacitors
- **Tools**
 - Multimeter
 - Power supply tester
 - Loopback plugs
 - POST card/USB

4.2 Given a scenario, troubleshoot hard drives and RAID arrays with appropriate tools.

- **Common symptoms**
 - Read/write failure
 - Slow performance
 - Loud clicking noise
 - Failure to boot
 - Drive not recognized
 - OS not found
 - RAID not found
- RAID stops working
- Proprietary crash screens (BSOD/pin wheel)
- S.M.A.R.T. errors
- **Tools**
 - Screwdriver
 - External enclosures
 - CHKDSK
- FORMAT
- File recovery software
- Bootrec
- Diskpart
- Defragmentation tool

4.3 Given a scenario, troubleshoot common video, projector and display issues.

- **Common symptoms**
 - VGA mode
 - No image on screen
 - Overheat shutdown
 - Dead pixels
- Artifacts
- Color patterns incorrect
- Dim image
- Flickering image
- Distorted image
- Distorted geometry
- Burn-in
- Oversized images and icons



4.4 Given a scenario, troubleshoot wired and wireless networks with appropriate tools.

• Common symptoms

- No connectivity
- APIPA/link local address
- Limited connectivity
- Local connectivity
- Intermittent connectivity
- IP conflict
- Slow transfer speeds
- Low RF signal
- SSID not found

• Hardware tools

- Cable tester
- Loopback plug
- Punchdown tools
- Tone generator and probe
- Wire strippers
- Crimper
- Wireless locator

• Command line tools

- PING
 - IPCONFIG/IFCONFIG
 - TRACERT
 - NETSTAT
 - NBTSTAT
 - NET
 - NETDOM
 - NSLOOKUP
-

4.5 Given a scenario, troubleshoot and repair common mobile device issues while adhering to the appropriate procedures.

• Common symptoms

- No display
- Dim display
- Flickering display
- Sticking keys
- Intermittent wireless
- Battery not charging
- Ghost cursor/pointer drift
- No power
- Num lock indicator lights

- No wireless connectivity
- No Bluetooth connectivity
- Cannot display to external monitor
- Touchscreen non-responsive
- Apps not loading
- Slow performance
- Unable to decrypt email
- Extremely short battery life
- Overheating
- Frozen system

- No sound from speakers
- GPS not functioning
- Swollen battery

• Disassembling processes for proper re-assembly

- Document and label cable and screw locations
 - Organize parts
 - Refer to manufacturer resources
 - Use appropriate hand tools
-

4.6 Given a scenario, troubleshoot printers with appropriate tools.

• Common symptoms

- Streaks
- Faded prints
- Ghost images
- Toner not fused to the paper
- Creased paper
- Paper not feeding
- Paper jam
- No connectivity

- Garbled characters on paper
- Vertical lines on page
- Backed up print queue
- Low memory errors
- Access denied
- Printer will not print
- Color prints in wrong print color
- Unable to install printer
- Error codes

- Printing blank pages
- No image on printer display

• Tools

- Maintenance kit
- Toner vacuum
- Compressed air
- Printer spooler

CompTIA A+ Acronyms

The following is a list of acronyms that 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	ACRONYM	SPELLED OUT
AC	Alternating Current	CPU	Central Processing Unit
ACL	Access Control List	CRT	Cathode Ray Tube
ACPI	Advanced Configuration Power Interface	DAC	Discretionary Access Control
ACT	Activity	DB-25	Serial Communications D-Shell Connector, 25 Pins
ADSL	Asymmetrical Digital Subscriber Line	DB-9	9 Pin D Shell Connector
AGP	Accelerated Graphics Port	DC	Direct Current
AHCI	Advanced Host Controller Interface	DDoS	Distributed Denial of Service
AP	Access Point	DDR	Double Data Rate
APIPA	Automatic Private Internet Protocol Addressing	DDR RAM	Double Data Rate Random-Access Memory
APM	Advanced Power Management	DDR SDRAM	Double Data Rate Synchronous Dynamic Random-Access Memory
ARP	Address Resolution Protocol	DFS	Distributed File System
ASR	Automated System Recovery	DHCP	Dynamic Host Configuration Protocol
ATA	Advanced Technology Attachment	DIMM	Dual Inline Memory Module
ATAPI	Advanced Technology Attachment Packet Interface	DIN	Deutsche Industrie Norm
ATM	Asynchronous Transfer Mode	DLT	Digital Linear Tape
ATX	Advanced Technology Extended	DLP	Digital Light Processing
AUP	Acceptable Use Policy	DMA	Direct Memory Access
A/V	Audio Video	DMZ	Demilitarized Zone
BIOS	Basic Input/Output System	DNS	Domain Name Service or Domain Name Server
BNC	Bayonet-Neill-Concelman or British Naval Connector	DoS	Denial of Service
BTX	Balanced Technology Extended	DRAM	Dynamic Random Access Memory
CAPTCHA	Completely Automated Public Turing Test to tell Computers and Humans Apart	DRM	Digital Rights Management
CCFL	Cold Cathode Fluorescent Lamp	DSL	Digital Subscriber Line
CD	Compact Disc	DVD	Digital Video Disc or Digital Versatile Disc
CD-ROM	Compact Disc-Read-Only Memory	DVD-RAM	Digital Video Disc-Random-Access Memory
CD-RW	Compact Disc-Rewritable	DVD-ROM	Digital Video Disc-Read-Only Memory
CDFS	Compact Disc File System	DVD-R	Digital Video Disc-Recordable
CFS	Central File System or Common File System or Command File System	DVD-RW	Digital Video Disc-Rewritable
CIFS	Common Internet File System	DVI	Digital Visual Interface
CMOS	Complementary Metal-Oxide Semiconductor	ECC	Error Correcting Code or Error Checking and Correction
CNR	Communications and Networking Riser	ECP	Extended Capabilities Port
COMx	Communication Port (x=Port Number)	EEPROM	Electrically Erasable Programmable Read-Only Memory

ACRONYM	SPELLED OUT	ACRONYM	SPELLED OUT
EFS	Encrypting File System	IMEI	International Mobile Equipment Identity
EIDE	Enhanced Integrated Drive Electronics	IMSI	International Mobile Subscriber Identity
EMI	Electromagnetic Interference	IP	Internet Protocol
EMP	Electromagnetic Pulse	IPCONFIG	Internet Protocol Configuration
EPROM	Erasable Programmable Read-Only Memory	IPP	Internet Printing Protocol
EPP	Enhanced Parallel Port	IPS	In-Plane Switching
ERD	Emergency Repair Disk	IPSec	Internet Protocol Security
ESD	Electrostatic Discharge	IR	Infrared
EULA	End-User License Agreement	IrDA	Infrared Data Association
EVGA	Extended Video Graphics Adapter/Array	IRP	Incident Response Plan
EVDO	Evolution Data Optimized or Evolution Data Only	IRQ	Interrupt Request
FAT	File Allocation Table	ISDN	Integrated Services Digital Network
FAT12	12-Bit File Allocation Table	ISO	International Organization for Standardization/ Industry Standards Organization
FAT16	16-Bit File Allocation Table	ISP	Internet Service Provider
FAT32	32-Bit File Allocation Table	JBOD	Just a Bunch Of Disks
FDD	Floppy Disk Drive	Kb	Kilobit
Fn	Function (referring to the function key on a laptop)	KB	Kilobyte or Knowledge Base
FPM	Fast Page Mode	LAN	Local Area Network
FRU	Field Replaceable Unit	LBA	Logical Block Addressing
FSB	Front Side Bus	LC	Lucent Connector
FTP	File Transfer Protocol	LCD	Liquid Crystal Display
FQDN	Fully Qualified Domain Name	LDAP	Lightweight Directory Access Protocol
Gb	Gigabit	LED	Light Emitting Diode
GB	Gigabyte	LI-ON	Lithium-Ion
GDI	Graphics Device Interface	LPD/LPR	Line Printer Daemon/Line Printer Remote
GHz	Gigahertz	LPT	Line Printer Terminal
GUI	Graphical User Interface	LVD	Low Voltage Differential
GPS	Global Positioning System	MAC	Media Access Control or Mandatory Access Control
GSM	Global System for Mobile Communications	MAPI	Messaging Application Programming Interface
HAL	Hardware Abstraction Layer	MAU	Media Access Unit or Media Attachment Unit
HAV	Hardware-Assisted Virtualization	Mb	Megabit
HCL	Hardware Compatibility List	MB	Megabyte
HDD	Hard Disk Drive	MBR	Master Boot Record
HDMI	High-Definition Media Interface	MBSA	Microsoft Baseline Security Analyzer
HPFS	High-Performance File System	MFD	Multi-Function Device
HTML	Hypertext Markup Language	MFP	Multi-Function Product
HTPC	Home Theater PC	MHz	Megahertz
HTTP	Hypertext Transfer Protocol	MicroDIMM	Micro Dual Inline Memory Module
HTTPS	Hypertext Transfer Protocol Over Secure Sockets Layer	MIDI	Musical Instrument Digital Interface
I/O	Input/Output	MIME	Multipurpose Internet Mail Extension
ICMP	Internet Control Message Protocol	MIMO	Multiple Input Multiple Output
ICR	Intelligent Character Recognition	MMC	Microsoft Management Console
IDE	Integrated Drive Electronics	MP3	Moving Picture Experts Group Layer 3 Audio
IDS	Intrusion Detection System	MP4	Moving Picture Experts Group Layer 4
IEEE	Institute of Electrical and Electronics Engineers	MPEG	Moving Picture Experts Group
IIS	Internet Information Services	MSCONFIG	Microsoft Configuration
IMAP	Internet Mail Access Protocol	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

ACRONYM	SPELLED OUT
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
OLED	Organic Light Emitting Diode
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
PE	Preinstallation Environment
PGA	Pin Grid Array
PGA2	Pin Grid Array 2
PII	Personally Identifiable Information
PIN	Personal Identification Number
PKI	Public Key Infrastructure
PnP	Plug and Play
POP3	Post Office Protocol 3
PoS	Point of Sale
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
PRL	Preferred Roaming List
PROM	Programmable Read-Only Memory
PS/2	Personal System/2 Connector
PTSN	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
RDP	Remote Desktop Protocol
RF	Radio Frequency
RFI	Radio Frequency Interference

ACRONYM	SPELLED OUT
RGB	Red Green Blue
RIP	Routing Information Protocol
RIS	Remote Installation Service
RISC	Reduced Instruction Set Computer
RJ-11	Registered Jack Function 11
RJ-45	Registered Jack Function 45
RMA	Returned Materials Authorization
ROM	Read-Only Memory
RTC	Real-Time Clock
SAN	Storage Area Network
SAS	Serial Attached SCSI
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
SFF	Small Form Factor
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 Transfer Protocol
SNMP	Simple Network Management Protocol
SoDIMM	Small outline Dual Inline Memory Module
SOHO	Small Office, Home Office
SP	Service Pack
SPDIF	Sony/Philips Digital Interface Format
SPGA	Staggered Pin Grid Array
SRAM	Static Random-Access Memory
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Sockets Layer
ST	Straight Tip
STP	Shielded Twisted Pair
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
TKIP	Temporal Key Integrity Protocol
TPM	Trusted Platform Module
UAC	User Account Control
UDF	User Defined Functions or Universal Disk Format or Universal Data Format
UDP	User Datagram Protocol
UEFI	Unified Extensible Firmware Interface
UNC	Universal Naming Convention
UPS	Uninterruptible Power Supply

ACRONYM	SPELLED OUT
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
VM	Virtual Machine
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
VRAM	Video Random-Access Memory
WAN	Wide Area Network
WAP	Wireless Access Protocol or Wireless Access Point
WEP	Wired Equivalent Privacy
WiFi	Wireless Fidelity
WINS	Windows Internet Name Service
WLAN	Wireless Local Area Network
WPA	Wireless Protected Access
WPS	WiFi Protected Setup
WUXGA	Wide Ultra Extended Graphics Array
XGA	Extended Graphics Array
ZIF	Zero Insertion Force
ZIP	Zig-zag Inline Package

A+ Proposed Hardware and Software List

CompTIA has included this sample list of hardware and software to assist candidates as they prepare for the A+ exam. This list may also be helpful for training companies who wish to create a lab component to their training offering. The bulleted lists below each topic are a sample list and not exhaustive.

EQUIPMENT

- Apple tablet/smartphone
- Android tablet/smartphone
- Windows tablet/smartphone
- Windows laptop/Mac laptop/Linux laptop
- Windows desktop/Mac desktop/Linux desktop
- Monitors
- Projectors
- SOHO router/switch
- Access point
- VoIP phone
- Printer
 - Laser/inkjet
 - Wireless
- Surge suppressor
- UPS

SPARE PARTS/HARDWARE

- Motherboards
- RAM
- Hard drives
- Power supplies
- Video cards
- Sound cards
- Network cards
- Wireless NICs
- Fans/cooling devices/heat sink
- CPUs
- Assorted connectors/cables
 - USB
 - HDMI
 - etc

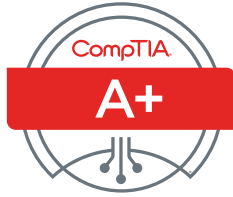
- Adapters
- Network cables
- Unterminated network cable/connectors
- AC adapters
- Optical drives
- Screws/stand-offs
- Cases
- Maintenance kit
- Mice/keyboards

TOOLS

- Screw drivers
- Multimeter
- Wire cutters
- Punchdown tool
- Crimper
- Power supply tester
- Cable stripper
- POST cards
- Standard technician toolkit
- ESD strap
- Thermal paste
- Cable tester
- WiFi analyzer
- SATA to USB connectors

SOFTWARE

- Operating system disks
- Antivirus software
- Virtualization software
- Anti-malware
- Driver software



CompTIA A+ Certification Exam Objectives

EXAM NUMBER: 220-902



About the Exam

Candidates are encouraged to use this document to help prepare for CompTIA A+ 220-902. In order to receive the CompTIA A+ certification, you must pass two exams: 220-901 and 220-902. CompTIA A+ 220-902 measures the necessary skills for an entry-level IT professional. Successful candidates will have the knowledge required to:

- Assemble components based on customer requirements
- Install, configure and maintain devices, PCs and software for end users
- Understand the basics of networking and security/forensics
- Properly and safely diagnose, resolve and document common hardware and software issues
- Apply troubleshooting skills
- Provide appropriate customer support
- Understand the basics of virtualization, desktop imaging and deployment

These content examples are meant to clarify the test objectives and should not be construed as a comprehensive listing of all the content of this examination.

EXAM ACCREDITATION

CompTIA A+ is accredited by ANSI to show compliance with the ISO 17024 Standard and, as such, undergoes regular reviews and updates to the exam objectives.

EXAM DEVELOPMENT

CompTIA exams result from subject matter expert workshops and industry-wide survey results regarding the skills and knowledge required of an entry-level IT professional.

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PLEASE NOTE

The lists of examples provided in bulleted format 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.

TEST DETAILS

Required exam	CompTIA A+ 220-902
Number of questions	Maximum of 90
Types of questions	Multiple choice and performance-based
Length of test	90 minutes
Recommended experience	Six to 12 months hands-on experience in the lab or field
Passing score	CompTIA A+ 220-902: 700 (on a scale of 900)

EXAM OBJECTIVES (DOMAINS)

The table below lists the domains measured by this examination and the extent to which they are represented:

DOMAIN	PERCENTAGE OF EXAMINATION
1.0 Windows Operating Systems	29%
2.0 Other Operating Systems & Technologies	12%
3.0 Security	22%
4.0 Software Troubleshooting	24%
5.0 Operational Procedures	13%
Total	100%



1.0 Windows Operating Systems

1.1 Compare and contrast various features and requirements of Microsoft Operating Systems (Windows Vista, Windows 7, Windows 8, Windows 8.1).

• Features:

- 32-bit vs. 64-bit
- Aero, gadgets, user account control, BitLocker, shadow copy, system restore, ready boost, sidebar, compatibility mode, virtual XP mode, easy transfer, administrative tools, defender, Windows firewall,

- security center, event viewer, file structure and paths, category view vs. classic view
- Side-by-side apps, Metro UI, Pinning, One Drive, Windows store, multimonitor task bars, charms, Start Screen, PowerShell, Live sign in, Action Center

- Upgrade paths – differences between in place upgrades, compatibility tools, Windows upgrade OS advisor

1.2 Given a scenario, install Windows PC operating systems using appropriate methods.

• Boot methods

- USB
- CD-ROM
- DVD
- PXE
- Solid state/flash drives
- Netboot
- External/hot swappable drive
- Internal hard drive (partition)

• Type of installations

- Unattended installation
- Upgrade
- Clean install
- Repair installation
- Multiboot

- Remote network installation
- Image deployment
- Recovery partition
- Refresh/restore

• Partitioning

- Dynamic
- Basic
- Primary
- Extended
- Logical
- GPT

• File system types/formatting

- exFAT
- FAT32
- NTFS

- CDFS
- NFS
- ext3, ext4
- Quick format vs. full format

- Load alternate third-party drivers when necessary
- Workgroup vs. domain setup
- Time/date/region/language settings
- Driver installation, software and windows updates
- Factory recovery partition
- Properly formatted boot drive with the correct partitions/format

1.3 Given a scenario, apply appropriate Microsoft command line tools.

- TASKKILL
- BOOTREC
- SHUTDOWN
- TASKLIST
- MD
- RD
- CD
- DEL
- FORMAT

- COPY
- XCOPY
- ROBOCOPY
- DISKPART
- SFC
- CHKDSK
- GPUPDATE
- GPRESULT
- DIR

- EXIT
- HELP
- EXPAND
- [command name] /?
- Commands available with standard privileges vs. administrative privileges



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

- **Administrative**
 - Computer management
 - Device manager
 - Local users and groups
 - Local security policy
 - Performance monitor
 - Services
 - System configuration
 - Task scheduler
 - Component services
 - Data sources
 - Print management
 - Windows memory diagnostics
 - Windows firewall
 - Advanced security
- **MSCONFIG**
 - General
 - Boot
 - Services
- Startup
- Tools
- **Task Manager**
 - Applications
 - Processes
 - Performance
 - Networking
 - Users
- **Disk management**
 - Drive status
 - Mounting
 - Initializing
 - Extending partitions
 - Splitting partitions
 - Shrink partitions
 - Assigning/changing drive letters
 - Adding drives
 - Adding arrays
 - Storage spaces
- **Other**
 - User State Migration tool (USMT)
 - Windows Easy Transfer
 - Windows Upgrade Advisor
- **System utilities**
 - REGEDIT
 - COMMAND
 - SERVICES.MSC
 - MMC
 - MSTSC
 - NOTEPAD
 - EXPLORER
 - MSINFO32
 - DXDIAG
 - DEFRAG
 - System restore
 - Windows Update

1.5 Given a scenario, use Windows Control Panel utilities.

- **Internet options**
 - Connections
 - Security
 - General
 - Privacy
 - Programs
 - Advanced
- **Display/display settings**
 - Resolution
 - Color depth
 - Refresh rate
- **User accounts**
- **Folder options**
 - View hidden files
- Hide extensions
- General options
- View options
- **System**
 - Performance (virtual memory)
 - Remote settings
 - System protection
- **Windows firewall**
- **Power options**
 - Hibernate
 - Power plans
 - Sleep/suspend
 - Standby
- **Programs and features**
- **HomeGroup**
- **Devices and printers**
- **Sound**
- **Troubleshooting**
- **Network and Sharing Center**
- **Device Manager**



1.6 Given a scenario, install and configure Windows networking on a client/desktop.

- HomeGroup vs. WorkGroup
 - Domain setup
 - Network shares/administrative shares/mapping drives
 - Printer sharing vs. network printer mapping
 - Establish networking connections
 - VPN
 - Dial-ups
 - Wireless
 - Wired
 - WWAN (Cellular)
 - Proxy settings
 - Remote Desktop Connection
 - Remote Assistance
 - Home vs. work vs. public network settings
 - Firewall settings
 - Exceptions
 - Configuration
 - Enabling/disabling Windows firewall
 - Configuring an alternative IP address in Windows
 - IP addressing
 - Subnet mask
 - DNS
 - Gateway
 - Network card properties
 - Half duplex/full duplex/auto
 - Speed
 - Wake-on-LAN
 - QoS
 - BIOS (on-board NIC)
-

1.7 Perform common preventive maintenance procedures using the appropriate Windows OS tools.

- Best practices
 - Scheduled backups
 - Scheduled disk maintenance
 - Windows updates
 - Patch management
 - Driver/firmware updates
 - Antivirus/Anti-malware updates
- Tools
 - Backup
 - System restore
 - Recovery image
 - Disk maintenance utilities



2.0 Other Operating Systems and Technologies

2.1 Identify common features and functionality of the Mac OS and Linux operating systems.

- **Best practices**
 - Scheduled backups
 - Scheduled disk maintenance
 - System updates/App Store
 - Patch management
 - Driver/firmware updates
 - Antivirus/anti-malware updates
- **Tools**
 - Backup/Time Machine
 - Restore/snapshot
 - Image recovery
 - Disk maintenance utilities
 - Shell/Terminal
 - Screen sharing
- **Features**
 - Force Quit
 - Multiple desktops/Mission Control
 - Key Chain
 - Spot Light
 - iCloud
 - Gestures
 - Finder
 - Remote Disc
 - Dock
 - Boot Camp
- **Basic Linux commands**
 - ls
 - grep
 - cd
 - shutdown
 - pwd vs. passwd
 - mv
 - cp
 - rm
 - chmod
 - chown
 - iwconfig/ifconfig
 - ps
 - su/sudo
 - apt-get
 - vi
 - dd

2.2 Given a scenario, set up and use client-side virtualization.

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

2.3 Identify basic cloud concepts.

- SaaS
- IaaS
- PaaS
- Public vs. Private vs. Hybrid vs. Community
- Rapid Elasticity
- On-demand
- Resource pooling
- Measured service

2.4 Summarize the properties and purpose of services provided by networked hosts.

- **Server roles**
 - Web server
 - File server
 - Print server
 - DHCP server
- **Internet appliance**
 - DNS server
 - Proxy server
 - Mail server
 - Authentication server
- **Legacy/embedded systems**
 - UTM
 - IDS
 - IPS

2.5 Identify basic features of mobile operating systems.

- **Android vs. iOS vs. Windows**
 - Open source vs. closed source/vendor specific
 - App source (Google Play Store, App Store, and Store)
 - Screen orientation (accelerometer/gyroscope)
 - Screen calibration
 - GPS and geotracking
 - WiFi calling
 - Launcher/GUI
 - Virtual assistant
 - SDK/APK
 - Emergency notification
 - Mobile payment service
-

2.6 Install and configure basic mobile device network connectivity and email.

- **Wireless/cellular data network (enable/disable)**
 - Hotspot
 - Tethering
 - Airplane mode
 - **Bluetooth**
 - Enable Bluetooth
 - Enable pairing
 - Find device for pairing
 - Enter appropriate pin code
 - Test connectivity
 - **Corporate and ISP email configuration**
 - POP3
 - IMAP
 - Port and SSL settings
 - Exchange, S/MIME
 - **Integrated commercial provider email configuration**
 - Google/Inbox
 - Yahoo
 - Outlook.com
 - iCloud
 - **PRI updates/PRL updates/Baseband updates**
 - **Radio firmware**
 - **IMEI vs. IMSI**
 - **VPN**
-

2.7 Summarize methods and data related to mobile device synchronization.

- **Types of data to synchronize**
 - Contacts
 - Programs
 - Email
 - Pictures
 - Music
 - Videos
 - Calendar
 - Bookmarks
- Documents
- Location data
- Social media data
- eBooks
- **Synchronization methods**
 - Synchronize to the Cloud
 - Synchronize to the Desktop
- **Mutual authentication for multiple services (SSO)**
- **Software requirements to install the application on the PC**
- **Connection types to enable synchronization**



3.0 Security

3.1 Identify common security threats and vulnerabilities.

- **Malware**
 - Spyware
 - Viruses
 - Worms
 - Trojans
 - Rootkits
 - Ransomware
- **Phishing**
- **Spear phishing**
- **Spoofing**
- **Social engineering**
- **Shoulder surfing**
- **Zero-day attack**
- **Zombie/botnet**
- **Brute forcing**
- **Dictionary attacks**
- **Non-compliant systems**
- **Violations of security best practices**
- **Tailgating**
- **Man-in-the-middle**

3.2 Compare and contrast common prevention methods.

- **Physical security**
 - Lock doors
 - Mantrap
 - Cable locks
 - Securing physical documents/ passwords/shredding
 - Biometrics
 - ID badges
 - Key fobs
 - RFID badge
- **Digital security**
 - Smart card
 - Tokens
 - Privacy filters
 - Entry control roster
 - Antivirus/Anti-malware
 - Firewalls
 - User authentication/strong passwords
 - Multifactor authentication
 - Directory permissions
- **User education/AUP**
- **Principle of least privilege**
- VPN
- DLP
- Disabling ports
- Access control lists
- Smart card
- Email filtering
- Trusted/untrusted software sources

3.3 Compare and contrast differences of basic Windows OS security settings.

- **User and groups**
 - Administrator
 - Power user
 - Guest
 - Standard user
- **NTFS vs. Share permissions**
 - Allow vs. deny
- Moving vs. copying folders and files
- File attributes
- **Shared files and folders**
 - Administrative shares vs. local shares
 - Permission propagation
 - Inheritance
- **System files and folders**
- **User authentication**
 - Single sign-on
- **Run as administrator vs. standard user**
- **BitLocker**
- **BitLocker-To-Go**
- **EFS**

3.4 Given a scenario, deploy and enforce security best practices to secure a workstation.

- **Password best practices**
 - Setting strong passwords
 - Password expiration
 - Changing default user names/passwords
 - Screensaver required password
 - BIOS/UEFI passwords
 - Requiring passwords
 - **Account management**
 - Restricting user permissions
 - Login time restrictions
 - Disabling guest account
 - Failed attempts lockout
 - Timeout/screen lock
 - **Disable autorun**
 - **Data encryption**
 - **Patch/update management**
-

3.5 Compare and contrast various methods for securing mobile devices.

- **Screen locks**
 - Fingerprint lock
 - Face lock
 - Swipe lock
 - Passcode lock
 - **Remote wipes**
 - **Locator applications**
 - **Remote backup applications**
 - **Failed login attempt restrictions**
 - **Antivirus/anti-malware**
 - **Patching/OS updates**
 - **Biometric authentication**
 - **Full device encryption**
 - **Multifactor authentication**
 - **Authenticator applications**
 - **Trusted sources vs. untrusted sources**
 - **Firewalls**
 - **Policies and procedures**
 - BYOD vs. corporate owned
 - Profile security requirements
-

3.6 Given a scenario, use appropriate data destruction and disposal methods.

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

3.7 Given a scenario, secure SOHO wireless and wired networks.

- **Wireless specific**
 - Changing default SSID
 - Setting encryption
 - Disabling SSID broadcast
 - Antenna and access point placement
 - Radio power levels
 - WPS
- **Change default usernames and passwords**
- **Enable MAC filtering**
- **Assign static IP addresses**
- **Firewall settings**
- **Port forwarding/mapping**
- **Disabling ports**
- **Content filtering/parental controls**
- **Update firmware**
- **Physical security**



4.0 Software Troubleshooting

4.1 Given a scenario, troubleshoot PC operating system problems with appropriate tools.

• Common symptoms

- Proprietary crash screens (BSOD/pinwheel)
- Failure to boot
- Improper shutdown
- Spontaneous shutdown/restart
- Device fails to start/detected
- Missing DLL message
- Services fails to start
- Compatibility error
- Slow system performance
- Boots to safe mode
- File fails to open

- Missing NTLDR
- Missing boot configuration data
- Missing operating system
- Missing graphical interface
- Missing GRUB/LILO
- Kernel panic
- Graphical Interface fails to load
- Multiple monitor misalignment/orientation

• Tools

- BIOS/UEFI
- SFC
- Logs

- System Recovery Options
- Repair disks
- Pre-installation environments
- MSCONFIG
- DEFRAG
- REGSRV32
- REGEDIT
- Event viewer
- Safe mode
- Command prompt
- Uninstall/reinstall/repair

4.2 Given a scenario, troubleshoot common PC security issues with appropriate tools and best practices.

• Common symptoms

- Pop-ups
- Browser redirection
- Security alerts
- Slow performance
- Internet connectivity issues
- PC/OS lock up
- Application crash
- OS updates failures
- Rogue antivirus
- Spam
- Renamed system files
- Files disappearing
- File permission changes
- Hijacked email
 - Responses from users regarding email
 - Automated replies from unknown sent email
- Access denied
- Invalid certificate (trusted root CA)

• Tools

- Antivirus software
- Anti-malware software
- Recovery console
- Terminal
- System restore/Snapshot
- Pre-installation environments
- Event viewer
- Refresh/restore
- MSCONFIG/Safe boot

• Best practice procedure for malware removal

1. Identify malware symptoms
2. Quarantine infected system
3. Disable system restore (in Windows)
4. Remediate infected systems
 - a. Update anti-malware software
 - b. Scan and removal techniques (safe mode, pre-installation environment)
5. Schedule scans and run updates
6. Enable system restore and create restore point (in Windows)
7. Educate end user



4.3 Given a scenario, troubleshoot common mobile OS and application issues with appropriate tools.

- **Common symptoms**
 - Dim display
 - Intermittent wireless
 - No wireless connectivity
 - No Bluetooth connectivity
 - Cannot broadcast to external monitor
 - Touchscreen non-responsive
 - Apps not loading
 - Slow performance
 - Unable to decrypt email
 - Extremely short battery life
 - Overheating
 - Frozen system
 - No sound from speakers
 - Inaccurate touch screen response
 - System lockout
 - **Tools**
 - Hard reset
 - Soft reset
 - Close running applications
 - Reset to factory default
 - Adjust configurations/settings
 - Uninstall/reinstall apps
 - Force stop
-

4.4 Given a scenario, troubleshoot common mobile OS and application security issues with appropriate tools.

- **Common symptoms**
 - Signal drop/weak signal
 - Power drain
 - Slow data speeds
 - Unintended WiFi connection
 - Unintended Bluetooth pairing
 - Leaked personal files/data
 - Data transmission overlimit
 - Unauthorized account access
 - Unauthorized root access
- Unauthorized location tracking
- Unauthorized camera/microphone activation
- High resource utilization
- **Tools**
 - Anti-malware
 - App scanner
 - Factory reset/clean install
 - Uninstall/reinstall apps
 - WiFi analyzer
- Force stop
- Cell tower analyzer
- Backup/restore
 - iTunes/iCloud/Apple Configurator
 - Google Sync
 - One Drive



5.0 Operational Procedures

5.1 Given a scenario, use appropriate safety procedures.

- **Equipment grounding**
- **Proper component handling and storage**
 - Antistatic bags
 - ESD straps
 - ESD mats
 - Self-grounding
- **Toxic waste handling**
 - Batteries
 - Toner
 - CRT
- **Personal safety**
 - Disconnect power before repairing PC
 - Remove jewelry
 - Lifting techniques
 - Weight limitations
 - Electrical fire safety
 - Cable management
 - Safety goggles
 - Air filter mask
- **Compliance with local government regulations**

5.2 Given a scenario with potential environmental impacts, apply the appropriate controls.

- **MSDS documentation for handling and disposal**
- **Temperature, humidity level awareness and proper ventilation**
- **Power surges, brownouts, blackouts**
 - Battery backup
 - Surge suppressor
- **Protection from airborne particles**
 - Enclosures
 - Air filters/mask
- **Dust and debris**
 - Compressed air
 - Vacuums
- **Compliance to local government regulations**

5.3 Summarize the process of addressing prohibited content/activity, and explain privacy, licensing and policy concepts.

- **Incident Response**
 - First response
 - Identify
 - Report through proper channels
 - Data/device preservation
 - Use of documentation/documentation changes
 - Chain of custody
 - Tracking of evidence/documenting process
- **Licensing/DRM/EULA**
 - Open source vs. commercial license
 - Personal license vs. enterprise licenses
- **Personally Identifiable Information**
- **Follow corporate end-user policies and security best practices**

5.4 Demonstrate proper communication techniques and professionalism.

- **Use proper language – avoid jargon, acronyms and slang when applicable**
- **Maintain a positive attitude/project confidence**
- **Actively listen (taking notes) and avoid interrupting the customer**
- **Be culturally sensitive**
 - Use appropriate professional titles, when applicable
- **Be on time (if late contact the customer)**
- **Avoid distractions**
 - Personal calls
 - Texting/social media sites
 - Talking to co-workers while interacting with customers
 - Personal interruptions
- **Dealing with difficult customer or situation**
 - Do not argue with customers and/or be defensive
 - Avoid dismissing customer problems
 - Avoid being judgmental
 - Clarify customer statements (ask open-ended questions to narrow the scope of the problem, restate the issue or question to verify understanding)
 - Do not disclose experiences via social media outlets
- **Set and meet expectations/timeline and communicate status with the customer**
 - Offer different repair/replacement options if applicable
- Provide proper documentation on the services provided
- Follow up with customer/user at a later date to verify satisfaction
- **Deal appropriately with customers confidential and private materials**
 - Located on a computer, desktop, printer, etc

5.5 Given a scenario, explain the troubleshooting theory.

- **Always consider corporate policies, procedures and impacts before implementing changes.**
 1. Identify the problem
 - Question the user and identify user changes to computer and perform backups before making changes
 2. Establish a theory of probable cause (question the obvious)
 - If necessary, conduct external or internal research based on symptoms
 3. Test the theory to determine cause
 - Once theory is confirmed, determine next steps to resolve problem
 - If theory is not confirmed, re-establish new theory or escalate
 4. Establish a plan of action to resolve the problem and implement the solution
 5. Verify full system functionality and if applicable implement preventive measures
 6. Document findings, actions and outcomes

CompTIA A+ Acronyms

The following is a list of acronyms that 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	ACRONYM	SPELLED OUT
AC	Alternating Current	CPU	Central Processing Unit
ACL	Access Control List	CRT	Cathode Ray Tube
ACPI	Advanced Configuration Power Interface	DAC	Discretionary Access Control
ACT	Activity	DB-25	Serial Communications D-Shell Connector, 25 Pins
ADSL	Asymmetrical Digital Subscriber Line	DB-9	9 Pin D Shell Connector
AGP	Accelerated Graphics Port	DC	Direct Current
AHCI	Advanced Host Controller Interface	DDoS	Distributed Denial of Service
AP	Access Point	DDR	Double Data Rate
APIPA	Automatic Private Internet Protocol Addressing	DDR RAM	Double Data Rate Random-Access Memory
APM	Advanced Power Management	DDR SDRAM	Double Data Rate Synchronous Dynamic Random-Access Memory
ARP	Address Resolution Protocol	DFS	Distributed File System
ASR	Automated System Recovery	DHCP	Dynamic Host Configuration Protocol
ATA	Advanced Technology Attachment	DIMM	Dual Inline Memory Module
ATAPI	Advanced Technology Attachment Packet Interface	DIN	Deutsche Industrie Norm
ATM	Asynchronous Transfer Mode	DLT	Digital Linear Tape
ATX	Advanced Technology Extended	DLP	Digital Light Processing
AUP	Acceptable Use Policy	DMA	Direct Memory Access
A/V	Audio Video	DMZ	Demilitarized Zone
BIOS	Basic Input/Output System	DNS	Domain Name Service or Domain Name Server
BNC	Bayonet-Neill-Concelman or British Naval Connector	DoS	Denial of Service
BTX	Balanced Technology Extended	DRAM	Dynamic Random-Access Memory
CAPTCHA	Completely Automated Public Turing Test to tell Computers and Humans Apart	DRM	Digital Rights Management
CCFL	Cold Cathode Fluorescent Lamp	DSL	Digital Subscriber Line
CD	Compact Disc	DVD	Digital Video Disc or Digital Versatile Disc
CD-ROM	Compact Disc-Read-Only Memory	DVD-RAM	Digital Video Disc-Random-Access Memory
CD-RW	Compact Disc-Rewritable	DVD-ROM	Digital Video Disc-Read-Only Memory
CDFS	Compact Disc File System	DVD-R	Digital Video Disc-Recordable
CFS	Central File System or Common File System or Command File System	DVD-RW	Digital Video Disc-Rewritable
CIFS	Common Internet File System	DVI	Digital Visual Interface
CMOS	Complementary Metal-Oxide Semiconductor	ECC	Error Correcting Code or Error Checking and Correction
CNR	Communications and Networking Riser	ECP	Extended Capabilities Port
COMx	Communication Port (x=Port Number)	EEPROM	Electrically Erasable Programmable Read-Only Memory

ACRONYM	SPELLED OUT	ACRONYM	SPELLED OUT
EFS	Encrypting File System	IIS	Internet Information Services
EIDE	Enhanced Integrated Drive Electronics	IMAP	Internet Mail Access Protocol
EMI	Electromagnetic Interference	IMEI	International Mobile Equipment Identity
EMP	Electromagnetic Pulse	IMSI	International Mobile Subscriber Identity
EPROM	Erasable Programmable Read-Only Memory	IP	Internet Protocol
EPP	Enhanced Parallel Port	IPCONFIG	Internet Protocol Configuration
ERD	Emergency Repair Disk	IPP	Internet Printing Protocol
ESD	Electrostatic Discharge	IPS	In-Plane Switching
EULA	End-User License Agreement	IPSec	Internet Protocol Security
EVGA	Extended Video Graphics Adapter/Array	IR	Infrared
EVDO	Evolution Data Optimized or Evolution Data Only	IrDA	Infrared Data Association
FAT	File Allocation Table	IRP	Incident Response Plan
FAT12	12-Bit File Allocation Table	IRQ	Interrupt Request
FAT16	16-Bit File Allocation Table	ISDN	Integrated Services Digital Network
FAT32	32-Bit File Allocation Table	ISO	International Organization for Standardization or Industry Standards Organization
FDD	Floppy Disk Drive	ISP	Internet Service Provider
Fn	Function (referring to the function key on a laptop)	JBOD	Just a Bunch of Disks
FPM	Fast Page Mode	Kb	Kilobit
FRU	Field Replaceable Unit	KB	Kilobyte or Knowledge Base
FSB	Front Side Bus	LAN	Local Area Network
FTP	File Transfer Protocol	LBA	Logical Block Addressing
FQDN	Fully Qualified Domain Name	LC	Lucent Connector
Gb	Gigabit	LCD	Liquid Crystal Display
GB	Gigabyte	LDAP	Lightweight Directory Access Protocol
GDI	Graphics Device Interface	LED	Light Emitting Diode
GHz	Gigahertz	LI-ON	Lithium-Ion
GUI	Graphical User Interface	LPD/LPR	Line Printer Daemon/Line Printer Remote
GPS	Global Positioning System	LPT	Line Printer Terminal
GSM	Global System for Mobile communications	LVD	Low Voltage Differential
HAL	Hardware Abstraction Layer	MAC	Media Access Control/Mandatory Access Control
HAV	Hardware-Assisted Virtualization	MAPI	Messaging Application Programming Interface
HCL	Hardware Compatibility List	MAU	Media Access Unit or Media Attachment Unit
HDD	Hard Disk Drive	Mb	Megabit
HDMI	High-Definition Media Interface	MB	Megabyte
HPFS	High-Performance File System	MBR	Master Boot Record
HTML	Hypertext Markup Language	MBSA	Microsoft Baseline Security Analyzer
HTPC	Home Theater PC	MFD	Multi-Function Device
HTTP	Hypertext Transfer Protocol	MFP	Multi-Function Product
HTTPS	Hypertext Transfer Protocol Over Secure Sockets Layer	MHz	Megahertz
I/O	Input/Output	MicroDIMM	Micro Dual Inline Memory Module
ICMP	Internet Control Message Protocol	MIDI	Musical Instrument Digital Interface
ICR	Intelligent Character Recognition	MIME	Multipurpose Internet Mail Extension
IDE	Integrated Drive Electronics	MIMO	Multiple Input, Multiple Output
IDS	Intrusion Detection System	MMC	Microsoft Management Console
IEEE	Institute of Electrical and Electronics Engineers	MP3	Moving Picture Experts Group Layer 3 Audio

ACRONYM	SPELLED OUT	ACRONYM	SPELLED OUT
MP4	Moving Picture Experts Group Layer 4	PRI	Preferred Roaming Index
MPEG	Moving Picture Experts Group	PRL	Preferred Roaming List
MSCONFIG	Microsoft Configuration	PROM	Programmable Read-Only Memory
MSDS	Material Safety Data Sheet	PS/2	Personal System/2
MUI	Multilingual User Interface	PSTN	Public Switched Telephone Network
NAC	Network Access Control	PSU	Power Supply Unit
NAS	Network Attached Storage	PVC	Permanent Virtual Circuit
NAT	Network Address Translation	PXE	Preboot Execution Environment
NETBIOS	Networked Basic Input/Output System	QoS	Quality of Service
NETBEUI	Networked Basic Input/Output System Extended User Interface	RAID	Redundant Array of Independent (or Inexpensive) Discs
NFS	Network File System	RAM	Random-Access Memory
NIC	Network Interface Card	RAS	Remote Access Service
NiCd	Nickel Cadmium	RDP	Remote Desktop Protocol
NiMH	Nickel Metal Hydride	RF	Radio Frequency
NLX	New Low Profile Extended	RFI	Radio Frequency Interference
NNTP	Network News Transfer Protocol	RGB	Red Green Blue
NTFS	New Technology File System	RIP	Routing Information Protocol
NTLDR	New Technology Loader	RIS	Remote Installation Service
NTP	Network Time Protocol	RISC	Reduced Instruction Set Computer
OCR	Optical Character Recognition	RJ-11	Registered Jack Function 11
OEM	Original Equipment Manufacturer	RJ-45	Registered Jack Function 45
OLED	Organic Light Emitting Diode	RMA	Returned Materials Authorization
OS	Operating System	ROM	Read-Only Memory
PAN	Personal Area Network	RTC	Real-Time Clock
PATA	Parallel Advanced Technology Attachment	SAN	Storage Area Network
PC	Personal Computer	SAS	Serial Attached SCSI
PCI	Peripheral Component Interconnect	SATA	Serial Advanced Technology Attachment
PCIe	Peripheral Component Interconnect express	SC	Subscription Channel
PCIX	Peripheral Component Interconnect Extended	SCP	Secure Copy Protection
PCL	Printer Control Language	SCSI	Small Computer System Interface
PCMCIA	Personal Computer Memory Card International Association	SCSI ID	Small Computer System Interface Identifier
PE	Preinstallation Environment	SD card	Secure Digital card
PGA	Pin Grid Array	SDRAM	Synchronous Dynamic Random Access Memory
PGA2	Pin Grid Array 2	SEC	Single Edge Connector
PII	Personally Identifiable Information	SFC	System File Checker
PIN	Personal Identification Number	SFF	Small Form Factor
PKI	Public Key Infrastructure	SLI	Scalable Link Interface or System Level Integration or Scanline Interleave mode
PnP	Plug and Play	S.M.A.R.T.	Self-Monitoring, Analysis, And Reporting Technology
POP3	Post Office Protocol 3	SMB	Server Message Block or Small-to-Midsize Business
PoS	Point of Sale	SMTP	Simple Mail Transfer Protocol
POST	Power-On Self Test	SNMP	Simple Network Management Protocol
POTS	Plain Old Telephone Service	SODIMM	Small Outline Dual Inline Memory Module
PPP	Point-to-Point Protocol	SOHO	Small Office, Home Office
PPTP	Point-to-Point Tunneling Protocol	SP	Service Pack

ACRONYM	SPELLED OUT
SPDIF	Sony-Philips Digital Interface Format
SPGA	Staggered Pin Grid Array
SRAM	Static Random Access Memory
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Sockets Layer
ST	Straight Tip
STP	Shielded Twisted Pair
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
TKIP	Temporal Key Integrity Protocol
TPM	Trusted Platform Module
UAC	User Account Control
UDF	User Defined Functions or Universal Disk Format or Universal Data Format
UDP	User Datagram Protocol
UEFI	Unified Extensible Firmware Interface
UNC	Universal Naming Convention
UPS	Uninterruptible Power Supply
URL	Uniform Resource Locator

ACRONYM	SPELLED OUT
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
VM	Virtual Machine
VoIP	Voice Over Internet Protocol
VPN	Virtual Private Network
VRAM	Video Random Access Memory
WAN	Wide Area Network
WAP	Wireless Access Protocol/Wireless Access Point
WEP	Wired Equivalent Privacy
WiFi	Wireless Fidelity
WINS	Windows Internet Name Service
WLAN	Wireless Local Area Network
WPA	Wireless Protected Access
WPS	WiFi Protected Setup
WUXGA	Wide Ultra Extended Graphics Array
XGA	Extended Graphics Array
ZIF	Zero-Insertion-Force
ZIP	Zigzag Inline Package

A+ Proposed Hardware and Software List

CompTIA has included this sample list of hardware and software to assist candidates as they prepare for the A+ exam. This list may also be helpful for training companies who wish to create a lab component to their training offering. The bulleted lists below each topic are a sample list and not exhaustive.

EQUIPMENT

- Apple tablet/smartphone
- Android tablet/smartphone
- Windows tablet/smartphone
- Windowslaptop/Mac laptop/Linux laptop
- Windows desktop/Mac desktop/Linux desktop
- Monitors
- Projectors
- SOHO router/switch
- Access point
- VoIP phone
- Printer
 - Laser/inkjet
 - Wireless
- Surge suppressor
- UPS

SPARE PARTS/HARDWARE

- Motherboards
- RAM
- Hard drives
- Power supplies
- Video cards
- Sounds cards
- Network cards
- Wireless NICs
- Fans/cooling devices/heat sink
- CPUs
- Assorted connectors/cables
 - USB
 - HDMI
 - etc

- Adapters
- Network cables
- Unterminated network cable/connectors
- AC adapters
- Optical drives
- Screws/stand-offs
- Cases
- Maintenance kit
- Mice/keyboards

TOOLS

- Screw drivers
- Multimeter
- Wire cutters
- Punchdown tool
- Crimper
- Power supply tester
- Cable stripper
- POST cards
- Standard technician toolkit
- ESD strap
- Thermal paste
- Cable tester
- WiFi analyzer
- SATA to USB connectors

SOFTWARE

- Operating system disks
- Antivirus software
- Virtualization software
- Anti-malware
- Driver software