CompTIA A+ Certification Exam: Core 1 Objectives

EXAM NUMBER: CORE 1 (220-1001)



CompTIA

About the Exam

Candidates are encouraged to use this document to help prepare for CompTIA A+ Core 1. In order to receive the CompTIA A+ certification, you must pass two exams: Core 1 (220-1001) and Core 2 (220-1002). CompTIA A+ Core 1 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 PCs, mobile devices, 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 scripting, 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 testing exam objectives. Please know that all related exam preparation materials will still be valid.

TEST DETAILS

Required exam	Core 1
Number of questions	Maximum of 90
Types of questions	Multiple choice and performance-based
Length of test	90 minutes
Recommended experience	12 months of experience as an IT support specialist
Passing score	675 (on a scale of 100–900)

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 Mobile Devices	14%
2.0 Networking	20%
3.0 Hardware	27%
4.0 Virtualization and Cloud Computing	12%
5.0 Hardware and Network Troubleshooting	27%
Total	**100%**



1.0 Mobile Devices

1.1 Given a scenario, install and configure laptop hardware and components.

- **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/Bluetooth module
  - Cellular card
  - Video card
  - Mini PCIe
  - Screen
  - DC jack
  - Battery
  - Touchpad
  - Plastics/frames
  - Speaker
  - System board
  - CPU

1.2 Given a scenario, install components within the display of a laptop.

- **Types**
  - LCD
  - OLED
- **WiFi antenna connector/placement**
- **Webcam**
- **Microphone**
- **Inverter**
- **Digitizer/touchscreen**

1.3 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
  - Touchpad (on/off)
  - Screen orientation
  - Media options (fast forward/rewind)
  - GPS (on/off)
  - Airplane mode
- **Docking station**
- **Port replicator**
- **Physical laptop lock and cable lock**
- **Rotating/removable screens**

1.4 Compare and contrast characteristics of various types of other mobile devices.

- **Tablets**
- **Smartphones**
- **Wearable technology devices**
  - Smart watches
  - Fitness monitors
  - VR/AR headsets
- **E-readers**
- **GPS**

1.5 Given a scenario, connect and configure accessories and ports of other mobile devices.

- **Connection types**
  - Wired
    - Micro-USB/Mini-USB/USB-C
    - Lightning
    - Tethering
    - Proprietary vendor-specific ports (communication/power)
  - Wireless
    - NFC
    - Bluetooth
    - IR
    - Hotspot
- **Accessories**
  - Headsets
  - Speakers
  - Game pads
  - Extra battery packs/battery chargers
  - Protective covers/waterproofing
  - Credit card readers
  - Memory/MicroSD

1.6 Given a scenario, configure basic mobile device network connectivity and application support.

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

1.7 Given a scenario, use methods to perform mobile device synchronization.

- **Synchronization methods**
  - Synchronize to the cloud
  - Synchronize to the desktop
  - Synchronize to the automobile
- **Types of data to synchronize**
  - Contacts
  - Applications
  - Email
  - Pictures
  - Music
  - Videos
  - Calendar
  - Bookmarks
  - Documents
  - Location data
  - Social media data
  - E-books
  - Passwords
- **Mutual authentication for multiple services (SSO)**
- **Software requirements to install the application on the PC**
- **Connection types to enable synchronization**



2.0 Networking

2.1 Compare and contrast TCP and UDP ports, protocols, and their purposes.

- **Ports and protocols**
  - 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
  - 67/68 – DHCP
  - 389 – LDAP
  - 161/162 – SNMP
- **TCP vs. UDP**

2.2 Compare and contrast common networking hardware devices.

- **Routers**
- **Switches**
  - Managed
  - Unmanaged
- **Access points**
- **Cloud-based network controller**
- **Firewall**
- **Network interface card**
- **Repeater**
- **Hub**
- **Cable/DSL modem**
- **Bridge**
- **Patch panel**
- **Power over Ethernet (PoE)**
  - Injectors
  - Switch
- **Ethernet over Power**

2.3 Given a scenario, install and configure a basic wired/wireless SOHO network.

- **Router/switch functionality**
- **Access point settings**
- **IP addressing**
- **NIC configuration**
  - Wired
  - Wireless
- **End-user device configuration**
- **IoT device configuration**
  - Thermostat
  - Light switches
  - Security cameras
  - Door locks
  - Voice-enabled, smart speaker/digital assistant
- **Cable/DSL modem configuration**
- **Firewall settings**
  - DMZ
  - Port forwarding
  - NAT
  - UPnP
  - Whitelist/blacklist
  - MAC filtering
- **QoS**
- **Wireless settings**
  - Encryption
  - Channels
  - QoS

2.4 Compare and contrast wireless networking protocols.

- **802.11a**
- **802.11b**
- **802.11g**
- **802.11n**
- **802.11ac**
- **Frequencies**
  - 2.4Ghz
  - 5Ghz
- **Channels**
  - 1–11
- **Bluetooth**
- **NFC**
- **RFID**
- **Zigbee**
- **Z-Wave**
- **3G**
- **4G**
- **5G**
- **LTE**

2.5 Summarize the properties and purposes of services provided by networked hosts.

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

2.6 Explain common network configuration concepts.

- **IP addressing**
  - Static
  - Dynamic
  - APIPA
  - Link local
- **DNS**
- **DHCP**
  - Reservations
- **IPv4 vs. IPv6**
- **Subnet mask**
- **Gateway**
- **VPN**
- **VLAN**
- **NAT**

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
  - WMN

2.8 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 Hardware

3.1 Explain basic cable types, features, and their purposes.

- **Network cables**
  - Ethernet
    - Cat 5
    - Cat 5e
    - Cat 6
    - Plenum
    - Shielded twisted pair
    - Unshielded twisted pair
    - 568A/B
  - Fiber
  - Coaxial
  - Speed and transmission limitations
- **Video cables**
  - VGA
  - HDMI
  - Mini-HDMI
  - DisplayPort
  - DVI (DVI-D/DVI-I)
- **Multipurpose cables**
  - Lightning
  - Thunderbolt
  - USB
  - USB-C
  - USB 2.0
  - USB 3.0
- **Peripheral cables**
  - Serial
- **Hard drive cables**
  - SATA
  - IDE
  - SCSI
- **Adapters**
  - DVI to HDMI
  - USB to Ethernet
  - DVI to VGA

3.2 Identify common connector types.

- **RJ-11**
- **RJ-45**
- **RS-232**
- **BNC**
- **RG-59**
- **RG-6**
- **USB**
- **Micro-USB**
- **Mini-USB**
- **USB-C**
- **DB-9**
- **Lightning**
- **SCSI**
- **eSATA**
- **Molex**

3.3 Given a scenario, install RAM types.

- **RAM types**
  - SODIMM
  - DDR2
  - DDR3
  - DDR4
- **Single channel**
- **Dual channel**
- **Triple channel**
- **Error correcting**
- **Parity vs. non-parity**

3.4 Given a scenario, select, install and configure storage devices.

- **Optical drives**
  - CD-ROM/CD-RW
  - DVD-ROM/DVD-RW/DVD-RW DL
  - Blu-ray
  - BD-R
  - BD-RE
- **Solid-state drives**
  - M2 drives
  - NVME
  - SATA 2.5
- **Magnetic hard drives**
  - 5,400rpm
  - 7,200rpm
  - 10,000rpm
  - 15,000rpm
  - Sizes:
    - 2.5
    - 3.5
- **Hybrid drives**
- **Flash**
  - SD card
  - CompactFlash
  - Micro-SD card
  - Mini-SD card
  - xD
- **Configurations**
  - RAID 0, 1, 5, 10
  - Hot swappable

3.5 Given a scenario, install and configure motherboards, CPUs, and add-on cards.

- **Motherboard form factor**
  - ATX
  - mATX
  - ITX
  - mITX
- **Motherboard connectors types**
  - PCI
  - PCIe
  - Riser card
  - Socket types
  - SATA
  - IDE
  - Front panel connector
  - Internal USB connector
- **BIOS/UEFI settings**
  - Boot options
  - Firmware updates
  - Security settings
  - Interface configurations
  - Security
    - Passwords
    - Drive encryption
      - TPM
      - LoJack
      - Secure boot
- **CMOS battery**
- **CPU features**
  - Single-core
  - Multicore
  - Virtualization
  - Hyperthreading
  - Speeds
  - Overclocking
  - Integrated GPU
- **Compatibility**
  - AMD
  - Intel
- **Cooling mechanism**
  - Fans
  - Heat sink
  - Liquid
  - Thermal paste
- **Expansion cards**
  - Video cards
    - Onboard
    - Add-on card
  - Sound cards
  - Network interface card
  - USB expansion card
  - eSATA card

3.6 Explain the purposes and uses of various peripheral types.

- **Printer**
- **ADF/flatbed scanner**
- **Barcode scanner/QR scanner**
- **Monitors**
- **VR headset**
- **Optical drive types**
- **Mouse**
- **Keyboard**
- **Touchpad**
- **Signature pad**
- **Game controllers**
- **Camera/webcam**
- **Microphone**
- **Speakers**
- **Headset**
- **Projector**
  - Lumens/brightness
- **External storage drives**
- **KVM**
- **Magnetic reader/chip reader**
- **NFC/tap pay device**
- **Smart card reader**

3.7 Summarize power supply types and features.

- **Input 115V vs. 220V**
- **Output 5V vs. 12V**
- **24-pin motherboard adapter**
- **Wattage rating**
- **Number of devices/types of devices to be powered**

3.8 Given a scenario, select and configure appropriate components for a custom PC configuration to meet customer specifications or needs.

- **Graphic/CAD/CAM design workstation**
  - SSD
  - 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**
  - SSD
  - High-end video/specialized GPU
  - High-definition sound card
  - High-end cooling
- **Network attached storage device**
  - Media streaming
  - File sharing
  - Gigabit NIC
  - RAID array
  - Hard drive
- **Standard thick client**
  - Desktop applications
  - Meets recommended requirements for selected OS
- **Thin client**
  - Basic applications
  - Meets minimum requirements for selected OS
  - Network connectivity

3.9 Given a scenario, install and configure common devices.

- **Desktop**
  - Thin client
  - Thick client
  - Account setup/settings
- **Laptop/common mobile devices**
  - Touchpad configuration
  - Touchscreen configuration
  - Application installations/configurations
  - Synchronization settings
  - Account setup/settings
  - Wireless settings

3.10 Given a scenario, configure SOHO multifunction devices/printers and 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

3.11 Given a scenario, install and maintain various print technologies.

- **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
  - Maintenance: Replace toner, apply maintenance kit, calibrate, clean
- **Inkjet**
  - Ink cartridge, print head, roller, feeder, duplexing assembly, carriage, and belt
  - Calibrate
  - Maintenance: Clean heads, replace cartridges, calibrate, clear jams
- **Thermal**
  - Feed assembly, heating element
  - Special thermal paper
  - Maintenance: Replace paper, clean heating element, remove debris
- **Impact**
  - Print head, ribbon, tractor feed
  - Impact paper
  - Maintenance: Replace ribbon, replace print head, replace paper
- **Virtual**
  - Print to file
  - Print to PDF
  - Print to XPS
  - Print to image
- **3D printers**
  - Plastic filament



4.0 Virtualization and Cloud Computing

4.1 Compare and contrast cloud computing concepts.

- **Common cloud models**
  - IaaS
  - SaaS
  - PaaS
  - Public vs. private vs. hybrid vs. community
- **Shared resources**
  - Internal vs. external
- **Rapid elasticity**
- **On-demand**
- **Resource pooling**
- **Measured service**
- **Metered**
- **Off-site email applications**
- **Cloud file storage services**
  - Synchronization apps
- **Virtual application streaming/ cloud-based applications**
  - Applications for cell phones/tablets
  - Applications for laptops/desktops
- **Virtual desktop**
  - Virtual NIC

4.2 Given a scenario, set up and configure client-side virtualization.

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



5.0 Hardware and Network Troubleshooting

5.1 Given a scenario, use the best practice methodology to resolve problems.

- **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
   - Inquire regarding environmental or infrastructure changes
   - Review system and application logs
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 the theory is confirmed, determine the 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**

5.2 Given a scenario, troubleshoot problems related to motherboards, RAM, CPUs, and power.

- **Common symptoms**
  - Unexpected shutdowns
  - System lockups
  - POST code beeps
  - Blank screen on bootup
  - BIOS time and setting 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
  - Log entries and error messages

5.3 Given a scenario, troubleshoot hard drives and RAID arrays.

- **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

5.4 Given a scenario, troubleshoot video, projector, and display issues.

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

5.5 Given a scenario, troubleshoot 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 reassembly**
  - Document and label cable and screw locations
  - Organize parts
  - Refer to manufacturer resources
  - Use appropriate hand tools

5.6 Given a scenario, troubleshoot printers.

- **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
  - Printing blank pages
  - No image on printer display
  - Multiple failed jobs in logs

5.7 Given a scenario, troubleshoot common wired and wireless network problems.

- **Common symptoms**
  - Limited connectivity
  - Unavailable resources
    - Internet
    - Local resources
      - Shares
      - Printers
      - Email
  - No connectivity
  - APIPA/link local address
  - Intermittent connectivity
  - IP conflict
  - Slow transfer speeds
  - Low RF signal
  - SSID not found

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
AC	Alternating Current
ACL	Access Control List
ACPI	Advanced Configuration Power Interface
ADF	Automatic Document Feeder
ADSL	Asymmetrical Digital Subscriber Line
AES	Advanced Encryption Standard
AHCI	Advanced Host Controller Interface
AP	Access Point
APIPA	Automatic Private Internet Protocol Addressing
APM	Advanced Power Management
ARP	Address Resolution Protocol
ASR	Automated System Recovery
ATA	Advanced Technology Attachment
ATAPI	Advanced Technology Attachment Packet Interface
ATM	Asynchronous Transfer Mode
ATX	Advanced Technology Extended
AUP	Acceptable Use Policy
A/V	Audio Video
BD-R	Blu-ray Disc Recordable
BIOS	Basic Input/Output System
BD-RE	Blu-ray Disc Rewritable
BNC	Bayonet-Neill-Concelman
BSOD	Blue Screen of Death
BYOD	Bring Your Own Device
CAD	Computer-Aided Design
CAPTCHA	Completely Automated Public Turing test to tell Computers and Humans Apart
CD	Compact Disc
CD-ROM	Compact Disc-Read-Only Memory
CD-RW	Compact Disc-Rewritable
CDFS	Compact Disc File System
CERT	Computer Emergency Response Team
CFS	Central File System, Common File System, or Command File System

ACRONYM	SPELLED OUT
CGA	Computer Graphics and Applications
CIDR	Classless Inter-Domain Routing
CIFS	Common Internet File System
CMOS	Complementary Metal-Oxide Semiconductor
CNR	Communications and Networking Riser
COMx	Communication port (x=port number)
CPU	Central Processing Unit
CRT	Cathode-Ray Tube
DaaS	Data as a Service
DAC	Discretionary Access Control
DB-25	Serial Communications D-Shell Connector, 25 pins
DB-9	Serial Communications D-Shell Connector, 9 pins
DBaaS	Database as a Service
DC	Direct Current
DDoS	Distributed Denial of Service
DDR	Double Data Rate
DDR RAM	Double Data Rate Random Access Memory
DFS	Distributed File System
DHCP	Dynamic Host Configuration Protocol
DIMM	Dual Inline Memory Module
DIN	Deutsche Industrie Norm
DLT	Digital Linear Tape
DLP	Digital Light Processing or Data Loss Prevention
DMA	Direct Memory Access
DMZ	Demilitarized Zone
DNS	Domain Name Service or Domain Name Server
DoS	Denial of Service
DRAM	Dynamic Random Access Memory
DRM	Digital Rights Management
DSL	Digital Subscriber Line
DVD	Digital Versatile Disc
DVD-RAM	Digital Versatile Disc-Random Access Memory
DVD-ROM	Digital Versatile Disc-Read Only Memory
DVD-R	Digital Versatile Disc-Recordable
DVD-RW	Digital Versatile Disc-Rewritable

ACRONYM	SPELLED OUT
DVI	Digital Visual Interface
DVI-D	Digital Visual Interface--Digital
ECC	Error Correcting 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
eSATA	External Serial Advanced Technology Attachment
ESD	Electrostatic Discharge
EULA	End User License Agreement
EVGA	Extended Video Graphics Adapter/Array
Ext2	Second Extended File System
exFAT	Extended File Allocation Table
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
FPM	Fast Page Mode
FSB	Front-Side Bus
FTP	File Transfer Protocol
FQDN	Fully Qualified Domain Name
GDDR	Graphics Double Data Rate
GDI	Graphics Device Interface
GUI	Graphical User Interface
GUID	Globally Unique Identifier
GPS	Global Positioning System
GPT	GUID Partition Table
GPU	Graphics Processing Unit
GSM	Global System for Mobile Communications
HAL	Hardware Abstraction Layer
HAV	Hardware Assisted Virtualization
HCL	Hardware Compatibility List
HDCP	High-Bandwidth Digital Content Protection
HDD	Hard Disk Drive
HDMI	High Definition Media Interface
HIPS	Host Intrusion Prevention System
HPFS	High Performance File System
HTML	Hypertext Markup Language
HTPC	Home Theater PC

ACRONYM	SPELLED OUT
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
I/O	Input/Output
IaaS	Infrastructure as a Service
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
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IPConfig	Internet Protocol Configuration
IPP	Internet Printing Protocol
IPS	Intrusion Prevention System
IPSec	Internet Protocol Security
IR	Infrared
IrDA	Infrared Data Association
IRP	Incident Response Plan
IRQ	Interrupt Request
ISA	Industry Standard Architecture
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ISP	Internet Service Provider
JBOD	Just a Bunch of Disks
KB	Knowledge Base
KVM	Kernel-based Virtual Machine
KVM	Keyboard-Video-Mouse
LAN	Local Area Network
LBA	Logical Block Addressing
LC	Lucent Connector
LCD	Liquid Crystal Display
LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode
LPD/LPR	Line Printer Daemon/Line Printer Remote
LPT	Line Printer Terminal
LVD	Low Voltage Differential
MAC	Media Access Control/Mandatory Access Control
MAN	Metropolitan Area Network
MAPI	Messaging Application Programming Interface
mATX	Micro Advanced Technology Extended
MAU	Media Access Unit/Media Attachment Unit
MBR	Master Boot Record
MBSA	Microsoft Baseline Security Analyzer

ACRONYM	SPELLED OUT
MDM	Mobile Device Management
MFA	Multifactor Authentication
MFD	Multifunction Device
MFP	Multifunction Product
MicroDIMM	Micro Dual Inline Memory Module
MIDI	Musical Instrument Digital Interface
MIME	Multipurpose Internet Mail Extension
MIMO	Multiple Input Multiple Output
MMC	Microsoft Management Console
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
MT-RJ	Mechanical Transfer Registered Jack
MUI	Multilingual User Interface
NaaS	Network as a Service
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
NFC	Near Field Communication
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
NTSC	National Transmission Standards Committee
NVMe	Non-volatile Memory Express
OCR	Optical Character Recognition
OEM	Original Equipment Manufacturer
OLED	Organic Light Emitting Diode
OS	Operating System
PaaS	Platform as a Service
PAL	Phase Alternating Line
PAN	Personal Area Network
PAT	Port Address Translation
PC	Personal Computer
PCI	Peripheral Component Interconnect
PCI	Payment Card Industry

ACRONYM	SPELLED OUT
PCIe	Peripheral Component Interconnect Express
PCIX	Peripheral Component Interconnect Extended
PCL	Printer Command Language
PCMCIA	Personal Computer Memory Card International Association
PE	Preinstallation Environment
PGA	Pin Grid Array
PGA2	Pin Grid Array 2
PGP	Pretty Good Protection
PII	Personally Identifiable Information
PIN	Personal Identification Number
PHI	Personal Health Information
PKI	Public Key Infrastructure
PnP	Plug and Play
PoE	Power over Ethernet
POP3	Post Office Protocol 3
PoS	Point of Sale
POST	Power-On Self-Test
POTS	Plain Old Telephone Service
PPM	Pages Per Minute
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
PVA	Patterned Vertical Alignment
PVC	Permanent Virtual Circuit
PXE	Preboot Execution Environment
QoS	Quality of Service
RADIUS	Remote Authentication Dial-In User Server
RAID	Redundant Array of Independent (or Inexpensive) Disks
RAM	Random Access Memory
RAS	Remote Access Service
RDP	Remote Desktop Protocol
RF	Radio Frequency
RFI	Radio Frequency Interference
RFID	Radio Frequency Identification
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

ACRONYM	SPELLED OUT
RMA	Returned Materials Authorization
ROM	Read-Only Memory
RPO	Recovery Point Objective
RTC	Real-Time Clock
RT	Recovery Time Objective
Saas	Software as a Service
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
SEC	Single Edge Connector
SFC	System File Checker
SFF	Small Form Factor
SFTP	Secure File Transfer Protocol
SIM	Subscriber Identity Module
SIMM	Single In-Line 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
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
SSD	Solid State Drive
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Sockets Layer
SSO	Single Sign-on
ST	Straight Tip
STP	Shielded Twisted Pair
SXGA	Super Extended Graphics Array
TACACS	Terminal Access Controller Access-Control System
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
TLS	Transport Layer Security
TN	Twisted Nematic
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
UPnP	Universal Plug and Play
UPS	Uninterruptible Power Supply
URL	Uniform Resource Locator
USB	Universal Serial Bus
USMT	User State Migration Tool
UTM	Unified Threat Management
UTP	Unshielded Twisted Pair
UXGA	Ultra Extended Graphics Array
VA	Vertical Alignment
VDC	Volts DC
VDI	Virtual Desktop Infrastructure
VESA	Video Electronics Standards Association
VFAT	Virtual File Allocation Table
VGA	Video Graphics Array
VLAN	Virtual LAN
VM	Virtual Machine
VNC	Virtual Network Computer
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
WMN	Wireless Mesh Network
WPA	Wireless Protected Access
WPA2	WiFi Protected Access 2
WPS	WiFi Protected Setup
WUXGA	Wide Ultra Extended Graphics Array
WWAN	Wireless Wide Area Network
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 that wish to create a lab component for their training offering. The bulleted lists below each topic are sample lists and not exhaustive.

EQUIPMENT

- Apple tablet/smartphone
- Android tablet/smartphone
- Windows tablet/Smartphone
- Chromebook
- Windows laptop/Mac laptop/Linux laptop
- Windows desktop/Mac desktop/Linux desktop
- Windows Server w/Active Directory and Print Management
- Monitors
- Projectors
- SOHO router/switch
- Access point
- VoIP phone
- Printer
  - Laser/inkjet
  - Wireless
  - 3D printer
- Surge suppressor
- UPS
- VR headset
- Smart devices (IoT devices)

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 cables/connectors
- AC adapters
- Optical drives
- Screws/stand-offs
- Cases
- Maintenance kit
- Mice/keyboards
- KVM
- Console cable

TOOLS

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

SOFTWARE

- Operating systems
  - Linux
  - Chrome OS
  - Microsoft Windows
  - Mac OS
  - Android
  - iOS
- PE Disk/Live CD
- Antivirus software
- Virtualization software
- Anti-malware
- Driver software

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CompTIA A+ Certification Exam: Core 2 Objectives

EXAM NUMBER: CORE 2 (220-1002)



CompTIA

About the Exam

Candidates are encouraged to use this document to help prepare for CompTIA A+ Core 2. In order to receive the CompTIA A+ certification, you must pass two exams: Core 1 (220-1001) and Core 2 (220-1002). CompTIA A+ Core 2 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 PCs, mobile devices, 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 scripting, 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 testing exam objectives. Please know that all related exam preparation materials will still be valid.

TEST DETAILS

Required exam	Core 2
Number of questions	Maximum of 90
Types of questions	Multiple choice and performance-based
Length of test	90 minutes
Recommended experience	12 months of experience as an IT support specialist
Passing score	700 (on a scale of 100–900)

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 Operating Systems	27%
2.0 Security	24%
3.0 Software Troubleshooting	26%
4.0 Operational Procedures	23%
Total	**100%**



1.0 Operating Systems

1.1 Compare and contrast common operating system types and their purposes.

- **32-bit vs. 64-bit**
  - RAM limitations
  - Software compatibility
- **Workstation operating systems**
  - Microsoft Windows
  - Apple Macintosh OS
  - Linux
- **Cell phone/tablet operating systems**
  - Microsoft Windows
  - Android
  - iOS
  - Chrome OS
- **Vendor-specific limitations**
  - End-of-life
  - Update limitations
- **Compatibility concerns between operating systems**

1.2 Compare and contrast features of Microsoft Windows versions.

- **Windows 7**
- **Windows 8**
- **Windows 8.1**
- **Windows 10**
- **Corporate vs. personal needs**
  - Domain access
  - BitLocker
  - Media center
  - BranchCache
  - EFS
- **Desktop styles/user interface**

1.3 Summarize general OS installation considerations and upgrade methods.

- **Boot methods**
  - Optical disc(CD-ROM, DVD, Blu-ray)
  - External drive/flash drive (USB/eSATA)
  - Network boot (PXE)
  - Internal fixed disk (HDD/SSD)
  - Internal hard drive (partition)
- **Type of installations**
  - Unattended installation
  - In-place 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
  - HFS
  - Swap partition
  - 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**
- **Prerequisites/hardware compatibility**
- **Application compatibility**
- **OS compatibility/upgrade path**

1.4 Given a scenario, use appropriate Microsoft command line tools.

- **Navigation**
  - dir
  - cd
  - ..
- **ipconfig**
- **ping**
- **tracert**
- **netstat**
- **nslookup**
- **shutdown**
- **dism**
- **sfc**
- **chkdsk**
- **diskpart**
- **taskkill**
- **gpupdate**
- **gpresult**
- **format**
- **copy**
- **xcopy**
- **robocopy**
- **net use**
- **net user**
- **[command name] /?**
- **Commands available with standard privileges vs. administrative privileges**

1.5 Given a scenario, use 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
  - Event Viewer
  - User Account Management
- **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
- **System utilities**
  - Regedit
  - Command
  - Services.msc
  - MMC
  - MSTSC
  - Notepad
  - Explorer
  - Msinfo32
  - DxDiag
  - Disk Defragmenter
  - System Restore
  - Windows Update

1.6 Given a scenario, use Microsoft 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
- **Credential Manager**
- **Programs and features**
- **HomeGroup**
- **Devices and Printers**
- **Sound**
- **Troubleshooting**
- **Network and Sharing Center**
- **Device Manager**
- **BitLocker**
- **Sync Center**

1.7 Summarize application installation and configuration concepts.

- **System requirements**
  - Drive space
  - RAM
- **OS requirements**
  - Compatibility
- **Methods of installation and deployment**
  - Local (CD/USB)
  - Network-based
- **Local user permissions**
  - Folder/file access for installation
- **Security considerations**
  - Impact to device
  - Impact to network

1.8 Given a scenario, configure Microsoft 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)

1.9 Given a scenario, use features and tools of the Mac OS and Linux client/desktop 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
  - Force Quit
- **Features**
  - 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
  - kill



2.0 Security

2.1 Summarize the importance of physical security measures.

- **Mantrap**
- **Badge reader**
- **Smart card**
- **Security guard**
- **Door lock**
- **Biometric locks**
- **Hardware tokens**
- **Cable locks**
- **Server locks**
- **USB locks**
- **Privacy screen**
- **Key fobs**
- **Entry control roster**

2.2 Explain logical security concepts.

- **Active Directory**
  - Login script
  - Domain
  - Group Policy/Updates
  - Organizational Units
  - Home Folder
  - Folder redirection
- **Software tokens**
- **MDM policies**
- **Port security**
- **MAC address filtering**
- **Certificates**
- **Antivirus/Anti-malware**
- **Firewalls**
- **User authentication/strong passwords**
- **Multifactor authentication**
- **Directory permissions**
- **VPN**
- **DLP**
- **Access control lists**
- **Smart card**
- **Email filtering**
- **Trusted/untrusted software sources**
- **Principle of least privilege**

2.3 Compare and contrast wireless security protocols and authentication methods.

- **Protocols and encryption**
  - WEP
  - WPA
  - WPA2
  - TKIP
  - AES
- **Authentication**
  - Single-factor
  - Multifactor
  - RADIUS
  - TACACS

2.4 Given a scenario, detect, remove, and prevent malware using appropriate tools and methods.

- **Malware**
  - Ransomware
  - Trojan
  - Keylogger
  - Rootkit
  - Virus
  - Botnet
  - Worm
  - Spyware
- **Tools and methods**
  - Antivirus
  - Anti-malware
  - Recovery console
  - Backup/restore
  - End user education
  - Software firewalls
  - DNS configuration

2.5 Compare and contrast social engineering, threats, and vulnerabilities.

- **Social engineering**
  - Phishing
  - Spear phishing
  - Impersonation
  - Shoulder surfing
  - Tailgating
  - Dumpster diving
- **DDoS**
- **DoS**
- **Zero-day**
- **Man-in-the-middle**
- **Brute force**
- **Dictionary**
- **Rainbow table**
- **Spoofing**
- **Non-compliant systems**
- **Zombie**

2.6 Compare and contrast the differences of basic Microsoft 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**

2.7 Given a scenario, implement security best practices to secure a workstation.

- **Password best practices**
  - Setting strong passwords
  - Password expiration
  - Screensaver required password
  - BIOS/UEFI passwords
  - Requiring passwords
- **Account management**
  - Restricting user permissions
  - Logon time restrictions
  - Disabling guest account
  - Failed attempts lockout
  - Timeout/screen lock
  - Change default admin user account/password
  - Basic Active Directory functions
    - Account creation
    - Account deletion
    - Password reset/unlock account
    - Disable account
- **Disable autorun**
- **Data encryption**
- **Patch/update management**

2.8 Given a scenario, implement methods for securing mobile devices.

- **Screen locks**
  - Fingerprint lock
  - Face lock
  - Swipe lock
  - Passcode lock
- **Remote wipes**
- **Locator applications**
- **Remote backup applications**
- **Failed login attempts 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

2.9 Given a scenario, implement 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

2.10 Given a scenario, configure security on 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**



3.0 Software Troubleshooting

3.1 Given a scenario, troubleshoot Microsoft Windows OS problems.

- **Common symptoms**
  - Slow performance
  - Limited connectivity
  - Failure to boot
  - No OS found
  - Application crashes
  - Blue screens
  - Black screens
  - Printing issues
  - Services fail to start
  - Slow bootup
  - Slow profile load
- **Common solutions**
  - Defragment the hard drive
  - Reboot
  - Kill tasks
  - Restart services
  - Update network settings
  - Reimage/reload OS
  - Roll back updates
  - Roll back devices drivers
  - Apply updates
  - Repair application
  - Update boot order
  - Disable Windows services/applications
  - Disable application startup
  - Safe boot
  - Rebuild Windows profiles

3.2 Given a scenario, troubleshoot and resolve PC security issues.

- **Common symptoms**
  - Pop-ups
  - Browser redirection
  - Security alerts
  - Slow performance
  - Internet connectivity issues
  - PC/OS lockup
  - Application crash
  - OS updates failures
  - Rogue antivirus
  - Spam
  - Renamed system files
  - Disappearing files
  - File permission changes
  - Hijacked email
    - Responses from users regarding email
    - Automated replies from unknown sent email
  - Access denied
  - Invalid certificate (trusted root CA)
  - System/application log errors

3.3 Given a scenario, use best practice procedures for malware removal.

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

3.4 Given a scenario, troubleshoot mobile OS and application issues.

- **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
  - App log errors

3.5 Given a scenario, troubleshoot mobile OS and application security issues.

- **Common symptoms**
  - Signal drop/weak signal
  - Power drain
  - Slow data speeds
  - Unintended WiFi connection
  - Unintended Bluetooth pairing
  - Leaked personal files/data
  - Data transmission over limit
  - Unauthorized account access
  - Unauthorized location tracking
  - Unauthorized camera/ microphone activation
  - High resource utilization



4.0 Operational Procedures

4.1 Compare and contrast best practices associated with types of documentation.

- **Network topology diagrams**
- **Knowledge base/articles**
- **Incident documentation**
- **Regulatory and compliance policy**
- **Acceptable use policy**
- **Password policy**
- **Inventory management**
  - Asset tags
  - Barcodes

4.2 Given a scenario, implement basic change management best practices.

- **Documented business processes**
- **Purpose of the change**
- **Scope the change**
- **Risk analysis**
- **Plan for change**
- **End-user acceptance**
- **Change board**
  - Approvals
- **Backout plan**
- **Document changes**

4.3 Given a scenario, implement basic disaster prevention and recovery methods.

- **Backup and recovery**
  - Image level
  - File level
  - Critical applications
- **Backup testing**
- **UPS**
- **Surge protector**
- **Cloud storage vs. local storage backups**
- **Account recovery options**

4.4 Explain common safety procedures.

- **Equipment grounding**
- **Proper component handling and storage**
  - Antistatic bags
  - ESD straps
  - ESD mats
  - Self-grounding
- **Toxic waste handling**
  - Batteries
  - Toner
  - CRT
  - Cell phones
  - Tablets
- **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 government regulations**

4.5 Explain environmental impacts and appropriate controls.

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

4.6 Explain the processes for addressing prohibited content/ activity, and 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
- **Regulated data**
  - PII
  - PCI
  - GDPR
  - PHI
- **Follow all policies and security best practices**

4.7 Given a scenario, use proper communication techniques and professionalism.

- **Use proper language and 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 coworkers while interacting with customers
  - Personal interruptions
- **Dealing with difficult customers or situations**
  - 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.

4.8 Identify the basics of scripting.

- **Script file types**
  - .bat
  - .ps1
  - .vbs
  - .sh
  - .py
  - .js
- **Environment variables**
- **Comment syntax**
- **Basic script constructs**
  - Basic loops
  - Variables
- **Basic data types**
  - Integers
  - Strings

4.9 Given a scenario, use remote access technologies.

- **RDP**
- **Telnet**
- **SSH**
- **Third-party tools**
  - Screen share feature
  - File share
- **Security considerations of each access method**

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
AC	Alternating Current
ACL	Access Control List
ACPI	Advanced Configuration Power Interface
ADF	Automatic Document Feeder
ADSL	Asymmetrical Digital Subscriber Line
AES	Advanced Encryption Standard
AHCI	Advanced Host Controller Interface
AP	Access Point
APIPA	Automatic Private Internet Protocol Addressing
APM	Advanced Power Management
ARP	Address Resolution Protocol
ASR	Automated System Recovery
ATA	Advanced Technology Attachment
ATAPI	Advanced Technology Attachment Packet Interface
ATM	Asynchronous Transfer Mode
ATX	Advanced Technology Extended
AUP	Acceptable Use Policy
A/V	Audio Video
BD-R	Blu-ray Disc Recordable
BIOS	Basic Input/Output System
BD-RE	Blu-ray Disc Rewritable
BNC	Bayonet-Neill-Concelman
BSOD	Blue Screen of Death
BYOD	Bring Your Own Device
CAD	Computer-Aided Design
CAPTCHA	Completely Automated Public Turing test to tell Computers and Humans Apart
CD	Compact Disc
CD-ROM	Compact Disc-Read-Only Memory
CD-RW	Compact Disc-Rewritable
CDFS	Compact Disc File System
CERT	Computer Emergency Response Team
CFS	Central File System, Common File System, or Command File System

ACRONYM	SPELLED OUT
CGA	Computer Graphics and Applications
CIDR	Classless Inter-Domain Routing
CIFS	Common Internet File System
CMOS	Complementary Metal-Oxide Semiconductor
CNR	Communications and Networking Riser
COMx	Communication port (x=port number)
CPU	Central Processing Unit
CRT	Cathode-Ray Tube
DaaS	Data as a Service
DAC	Discretionary Access Control
DB-25	Serial Communications D-Shell Connector, 25 pins
DB-9	Serial Communications D-Shell Connector, 9 pins
DBaas	Database as a Service
DC	Direct Current
DDoS	Distributed Denial of Service
DDR	Double Data Rate
DDR RAM	Double Data Rate Random Access Memory
DFS	Distributed File System
DHCP	Dynamic Host Configuration Protocol
DIMM	Dual Inline Memory Module
DIN	Deutsche Industrie Norm
DLT	Digital Linear Tape
DLP	Digital Light Processing or Data Loss Prevention
DMA	Direct Memory Access
DMZ	Demilitarized Zone
DNS	Domain Name Service or Domain Name Server
DoS	Denial of Service
DRAM	Dynamic Random Access Memory
DRM	Digital Rights Management
DSL	Digital Subscriber Line
DVD	Digital Versatile Disc
DVD-RAM	Digital Versatile Disc-Random Access Memory
DVD-ROM	Digital Versatile Disc-Read Only Memory
DVD-R	Digital Versatile Disc-Recordable
DVD-RW	Digital Versatile Disc-Rewritable

ACRONYM	SPELLED OUT
DVI	Digital Visual Interface
DVI-D	Digital Visual Interface-Digital
ECC	Error Correcting 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
eSATA	External Serial Advanced Technology Attachment
ESD	Electrostatic Discharge
EULA	End User License Agreement
EVGA	Extended Video Graphics Adapter/Array
Ext2	Second Extended File System
exFAT	Extended File Allocation Table
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
FPM	Fast Page Mode
FSB	Front-Side Bus
FTP	File Transfer Protocol
FQDN	Fully Qualified Domain Name
GDDR	Graphics Double Data Rate
GDI	Graphics Device Interface
GUI	Graphical User Interface
GUID	Globally Unique Identifier
GPS	Global Positioning System
GPT	GUID Partition Table
GPU	Graphics Processing Unit
GSM	Global System for Mobile Communications
HAL	Hardware Abstraction Layer
HAV	Hardware Assisted Virtualization
HCL	Hardware Compatibility List
HDCP	High-Bandwidth Digital Content Protection
HDD	Hard Disk Drive
HDMI	High Definition Media Interface
HIPS	Host Intrusion Prevention System
HPFS	High Performance File System
HTML	Hypertext Markup Language
HTPC	Home Theater PC

ACRONYM	SPELLED OUT
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
I/O	Input/Output
IaaS	Infrastructure as a Service
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
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IPConfig	Internet Protocol Configuration
IPP	Internet Printing Protocol
IPS	Intrusion Prevention System
IPSec	Internet Protocol Security
IR	Infrared
IrDA	Infrared Data Association
IRP	Incident Response Plan
IRQ	Interrupt Request
ISA	Industry Standard Architecture
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
ISP	Internet Service Provider
JBOD	Just a Bunch of Disks
KB	Knowledge Base
KVM	Kernel-based Virtual Machine
KVM	Keyboard-Video-Mouse
LAN	Local Area Network
LBA	Logical Block Addressing
LC	Lucent Connector
LCD	Liquid Crystal Display
LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode
LPD/LPR	Line Printer Daemon/Line Printer Remote
LPT	Line Printer Terminal
LVD	Low Voltage Differential
MAC	Media Access Control/Mandatory Access Control
MAN	Metropolitan Area Network
MAPI	Messaging Application Programming Interface
mATX	Micro Advanced Technology Extended
MAU	Media Access Unit/Media Attachment Unit
MBR	Master Boot Record
MBSA	Microsoft Baseline Security Analyzer

ACRONYM	SPELLED OUT
MDM	Mobile Device Management
MFA	Multifactor Authentication
MFD	Multifunction Device
MFP	Multifunction Product
MicroDIMM	Micro Dual Inline Memory Module
MIDI	Musical Instrument Digital Interface
MIME	Multipurpose Internet Mail Extension
MIMO	Multiple Input Multiple Output
MMC	Microsoft Management Console
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
MT-RJ	Mechanical Transfer Registered Jack
MUI	Multilingual User Interface
NaaS	Network as a Service
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
NFC	Near Field Communication
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
NTSC	National Transmission Standards Committee
NVMe	Non-volatile Memory Express
OCR	Optical Character Recognition
OEM	Original Equipment Manufacturer
OLED	Organic Light Emitting Diode
OS	Operating System
PaaS	Platform as a Service
PAL	Phase Alternating Line
PAN	Personal Area Network
PAT	Port Address Translation
PC	Personal Computer
PCI	Peripheral Component Interconnect
PCI	Payment Card Industry

ACRONYM	SPELLED OUT
PCIe	Peripheral Component Interconnect Express
PCIX	Peripheral Component Interconnect Extended
PCL	Printer Command Language
PCMCIA	Personal Computer Memory Card International Association
PE	Preinstallation Environment
PGA	Pin Grid Array
PGA2	Pin Grid Array 2
PGP	Pretty Good Protection
PII	Personally Identifiable Information
PIN	Personal Identification Number
PHI	Personal Health Information
PKI	Public Key Infrastructure
PnP	Plug and Play
PoE	Power over Ethernet
POP3	Post Office Protocol 3
PoS	Point of Sale
POST	Power-On sSelf-tTest
POTS	Plain Old Telephone Service
PPM	Pages Per Minute
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
PVA	Patterned Vertical Alignment
PVC	Permanent Virtual Circuit
PXE	Preboot Execution Environment
QoS	Quality of Service
RADIUS	Remote Authentication Dial-In User Server
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
RFID	Radio Frequency Identification
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

ACRONYM	SPELLED OUT
RMA	Returned Materials Authorization
ROM	Read-Only Memory
RPO	Recovery Point Objective
RTC	Real-Time Clock
RTO	Recovery Time Objective
SaaS	Software as a Service
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
SEC	Single Edge Connector
SFC	System File Checker
SFF	Small Form Factor
SFTP	Secure File Transfer Protocol
SIM	Subscriber Identity Module
SIMM	Single In-Line 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
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
SSD	Solid State Drive
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Sockets Layer
SSO	Single Sign-on
ST	Straight Tip
STP	Shielded Twisted Pair
SXGA	Super Extended Graphics Array
TACACS	Terminal Access Controller Access-Control System
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
TLS	Transport Layer Security
TN	Twisted Nematic
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
UPnP	Universal Plug and Play
UPS	Uninterruptible Power Supply
URL	Uniform Resource Locator
USB	Universal Serial Bus
USMT	User State Migration Tool
UTM	Unified Threat Management
UTP	Unshielded Twisted Pair
UXGA	Ultra Extended Graphics Array
VA	Vertical Alignment
VDC	Volts DC
VDI	Virtual Desktop Infrastructure
VESA	Video Electronics Standards Association
VFAT	Virtual File Allocation Table
VGA	Video Graphics Array
VLAN	Virtual LAN
VM	Virtual Machine
VNC	Virtual Network Computer
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
WMN	Wireless Mesh Network
WPA	Wireless Protected Access
WPA2	WiFi Protected Access 2
WPS	WiFi Protected Setup
WUXGA	Wide Ultra Extended Graphics Array
WWAN	Wireless Wide Area Network
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 that wish to create a lab component for their training offering. The bulleted lists below each topic are sample lists and not exhaustive.

EQUIPMENT

- Apple tablet/smartphone
- Android tablet/smartphone
- Windows tablet/Smartphone
- Chromebook
- Windows laptop/Mac laptop/Linux laptop
- Windows desktop/Mac desktop/Linux desktop
- Windows Server w/Active Directory and Print Management
- Monitors
- Projectors
- SOHO router/switch
- Access point
- VoIP phone
- Printer
  - Laser/inkjet
  - Wireless
  - 3D printer
- Surge suppressor
- UPS
- VR headset
- Smart devices (IoT devices)

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 cables/connectors
- AC adapters
- Optical drives
- Screws/stand-offs
- Cases
- Maintenance kit
- Mice/keyboards
- KVM
- Console cable

TOOLS

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

SOFTWARE

- Operating systems
  - Linux
  - Chrome OS
  - Microsoft Windows
  - Mac OS
  - Android
  - iOS
- PE Disk/Live CD
- Antivirus software
- Virtualization software
- Anti-malware
- Driver software

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