

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, lo-jack, 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
 - North Bridge
 - South Bridge
- CMOS battery
- Power connections and types
- Fan connectors
- Front/Top panel connectors
 - USB
 - Audio
 - Power button
 - Power light

- Drive activity lights
- Reset button
- Bus speeds

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
 - Micro-SD
 - Mini-SD
 - 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
 - DRM
 - 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
 - Micro-ATX
 - 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
 - Flourescent 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 converters
 - 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. adhoc
 - 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

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, 445 - SMB
 - 548 or 427 - AFP
- Protocols
 - DHCP
 - DNS
 - LDAP
 - SNMP
 - SMB
 - CIFS
 - SSH
 - AFP
- 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

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

2.9 Given a scenario, use appropriate networking tools.

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

3.0 Mobile Devices

3.1 Install and configure laptop hardware and components.

- Expansion options

- Express card /34
- Express card /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
 - TTL vs. IPS
 - Fluorescent vs. LED backlighting
 - OLED
- Wi-Fi 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
- Smart phones
- Wearable technology devices
 - Smart watches
 - Fitness monitors
 - Glasses and headsets
- Phablets
- e-Readers
- Smart camera
- GPS

3.5 Compare and contrast accessories & 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
 - Punch down 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

Introduction

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

Acronym	Definition
AC	alternating current
ACL	access control list
ACPI	advanced configuration power interface
ACT	activity
ADSL	asymmetrical digital subscriber line
AGP	accelerated graphics port
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